AUGUST 1960

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

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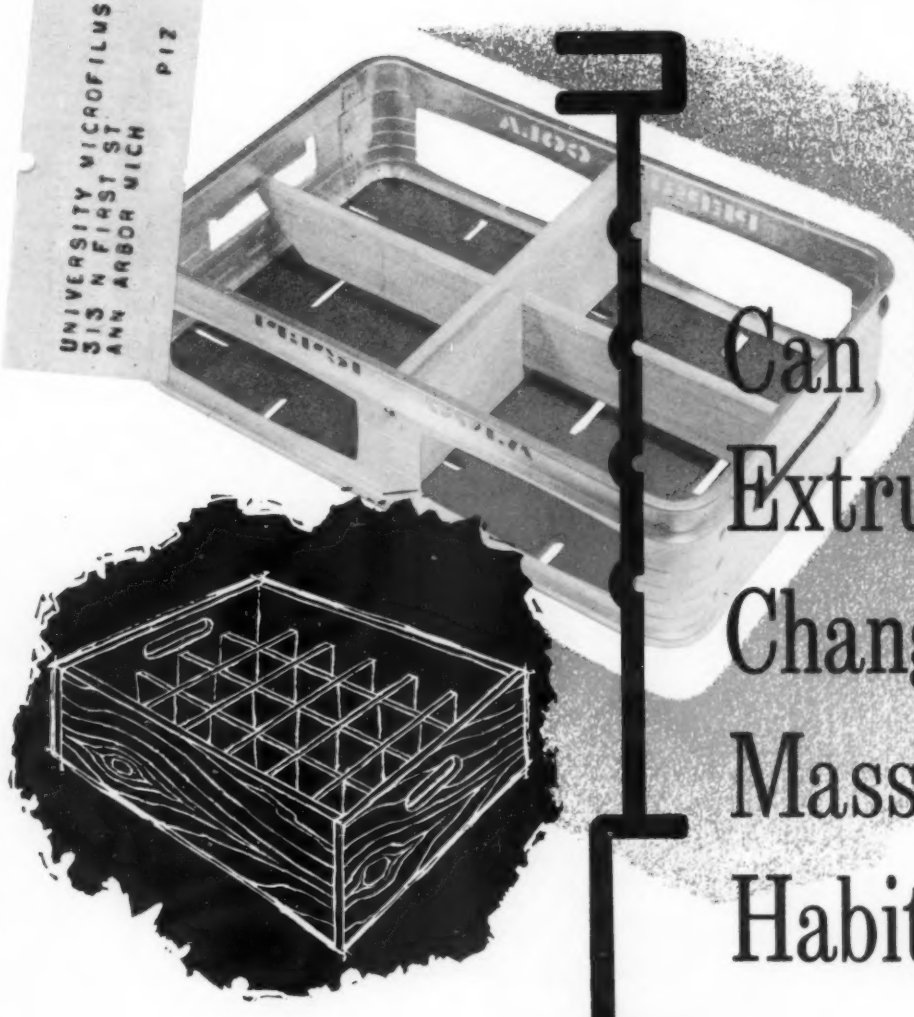

Can Extrusions Change Mass Buying Habits?

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

PMM

The magazine for design, finishing and the use of:

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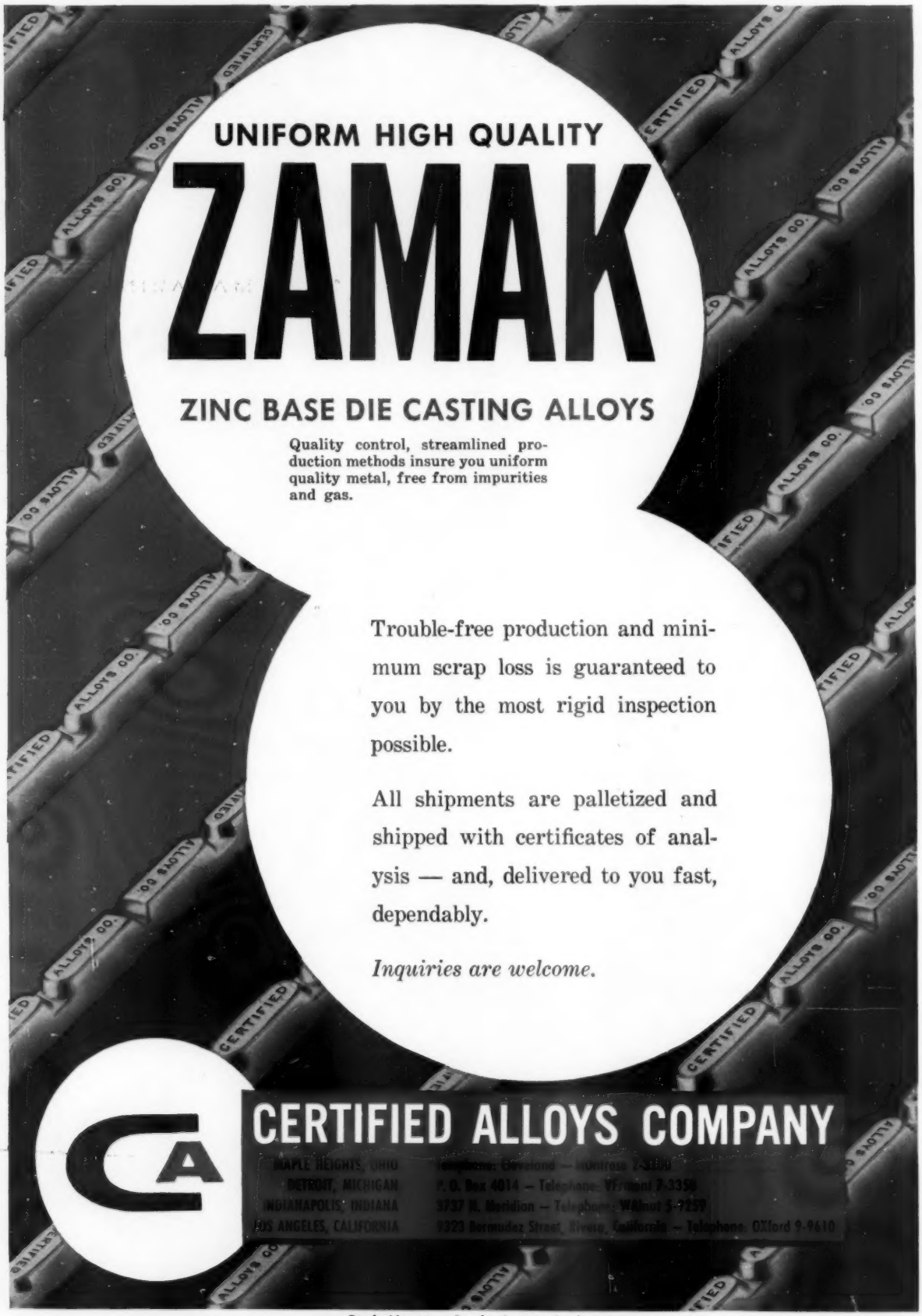
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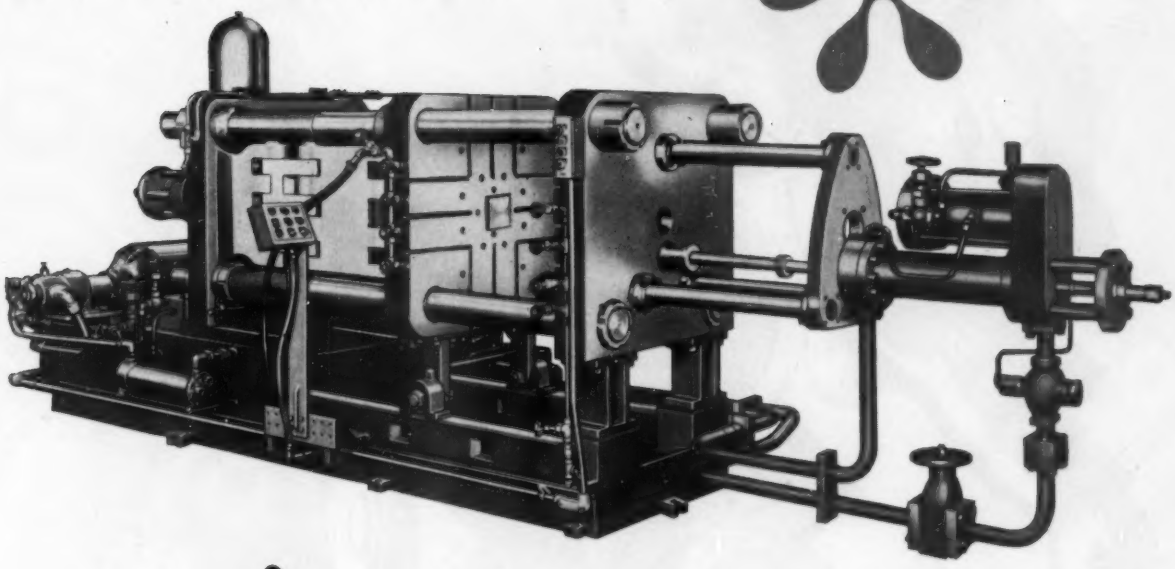

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Die Thickness	Min. Max.	8 36
Die Stroke	Min. Max.	9 15
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Injection Cyl. Diameter		4⅜
Injection Cyl. Stroke (Adj.)		14 to 19½
Shot Position		on center and 6" below center

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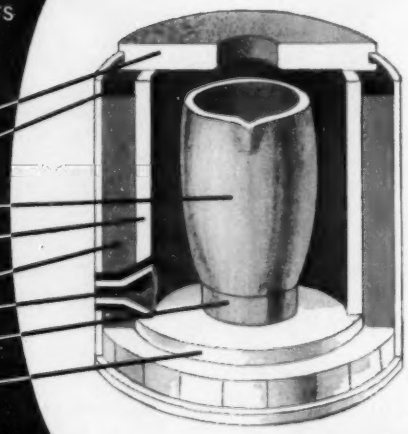

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With the A-L Steelector System

How can you pick the right tool steel when there are more than 1000 brands, each jostling for your attention? And how can you pick a tool steel and know before you order that the grade you want is available—without delays—in the size and shape you need?

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It's easy to make accurate selections with the STEELECTOR Program. The three STEELECTOR cards—covering general purpose tool steel applications, hot work applications, and high speed grades—show at a glance the comparative properties of tool steel grades that will suit 96% of all tool steel applications listed in the A-L Tool Steel Handbook.

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The new A-L Tool Steel STEELECTOR booklet contains the STEELECTOR Cards, descriptions of the various grades, and explains the individual Data Stock Lists available for every grade. For your own copy ask your Allegheny Ludlum sales representative, or write: ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. PM-8.***

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PMM
PRECISION METAL MOLDING,
the magazine that brings its readers
more than 40 articles per year on extrusions,
now announces . . .

The First Annual EXTRUSION DIRECTORY

IT WILL INCLUDE everyone in the extrusion industry. Listings will be based on accurate, up-to-date information obtained from companies listed. Here's what will be included:

- **EXTRUDERS** — arranged alphabetically and geographically, with information about metals extruded by each.
- **PROPRIETARY EXTRUDED ITEMS** —made by extruders will be listed.
- **EXTRUSION EQUIPMENT** — arranged according to major headings, will include manufacturers of machinery, furnaces and heaters, dies and die steels and all other equipment used in extrusion.
- **METALS AND ALLOYS** — producers will be listed.
- **EXTRUSION MATERIALS** — listings will include expendable supplies such as lubricants, hydraulic fluids, etc.
- **TECHNICAL SECTION** — including specifications, properties and design information for engineers and buyers.

LISTINGS ARE FREE. Everyone concerned with extrusions will be listed. Only requirement is the completion of a questionnaire so that all information listed will be accurate.

THE OCTOBER 1960 ISSUE OF PRECISION METAL MOLDING will include the Extrusion Directory as the central editorial feature. (Closing date for reserving advertising space is Sept. 1.)

BONUS DISTRIBUTION of the PMM Extrusion Directory will be made at the Metal Show in Philadelphia, in addition to PMM's 24,000 regular readers.

BUYERS GUIDE for everyone concerned with designing, specifying, buying, producing or finishing extrusions will be kept on hand for an entire year.

YOUR ADVERTISING will get extra mileage and year-round effectiveness in PMM's annual Extrusion Directory. It's the best buy for your advertising dollars. Let us give you all the facts.

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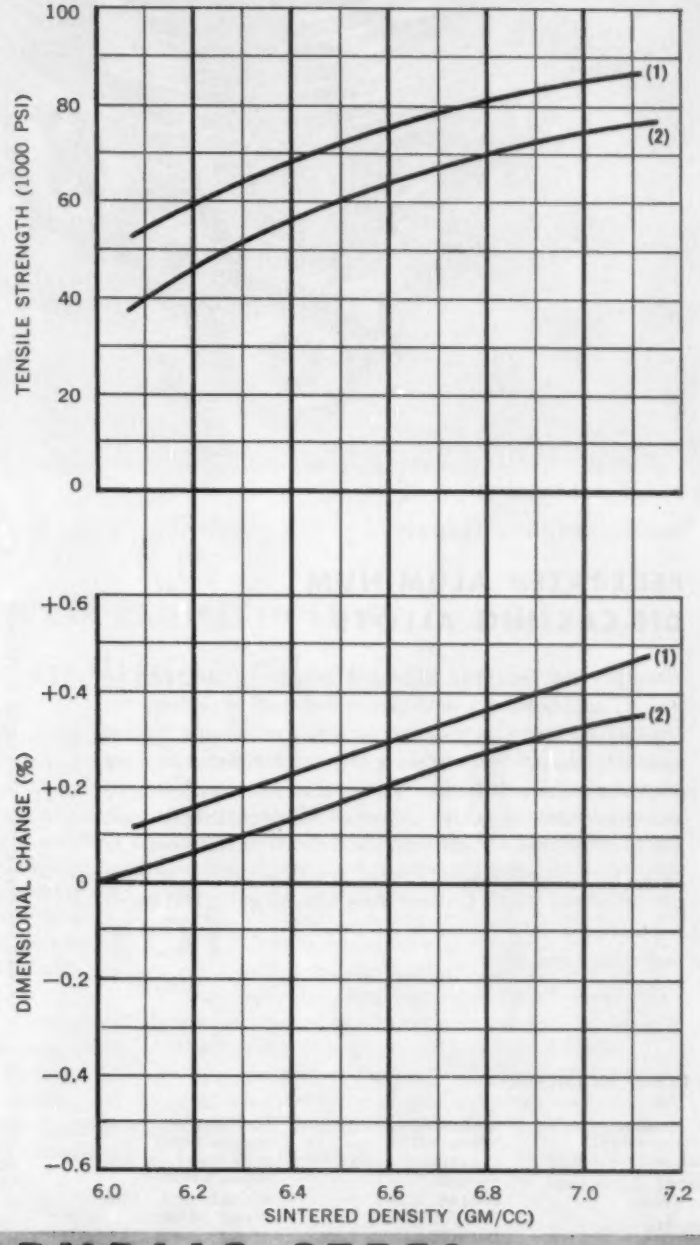
A Performance Report on

REPUBLIC'S NEW MHS6450 ALLOY POWDER

The information contained in the accompanying charts illustrates the performance of Republic's new medium high strength alloy powder, MHS6450, with 2% copper and varying amounts of carbon.

Specially prepared data for designers, tool engineers, metallurgists, and fabricators on the chemical composition, physical properties, and test evaluations of MHS6450 is contained in Booklet Adv. 1170. Write Dept. PM-9872, 1441 Republic Building, Cleveland 1, Ohio.

COPPER ADDITION	2%
COMBINED CARBON	(1) 0.8%
	(2) 0.4%
LUBRICANT	1%
SINTERING TEMPERATURE	2050°F
SINTERING TIME	30 MIN
SINTERING ATMOSPHERE	ENDO
DEW POINT	(1) 12°F
	(2) 24°F



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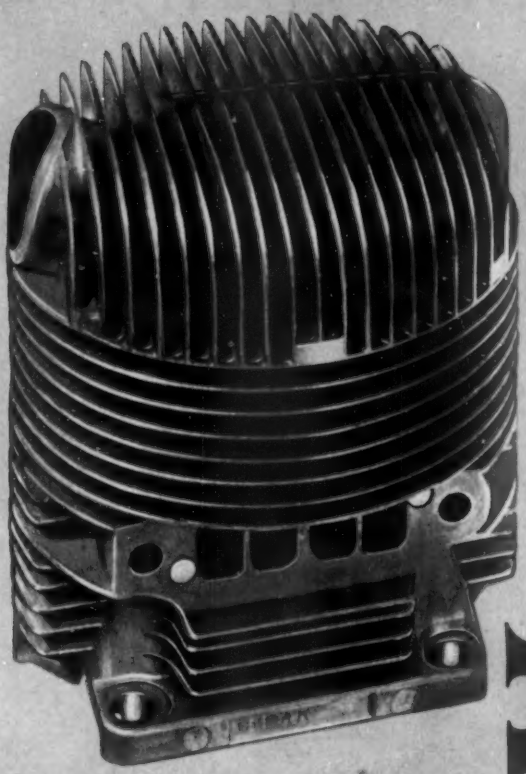

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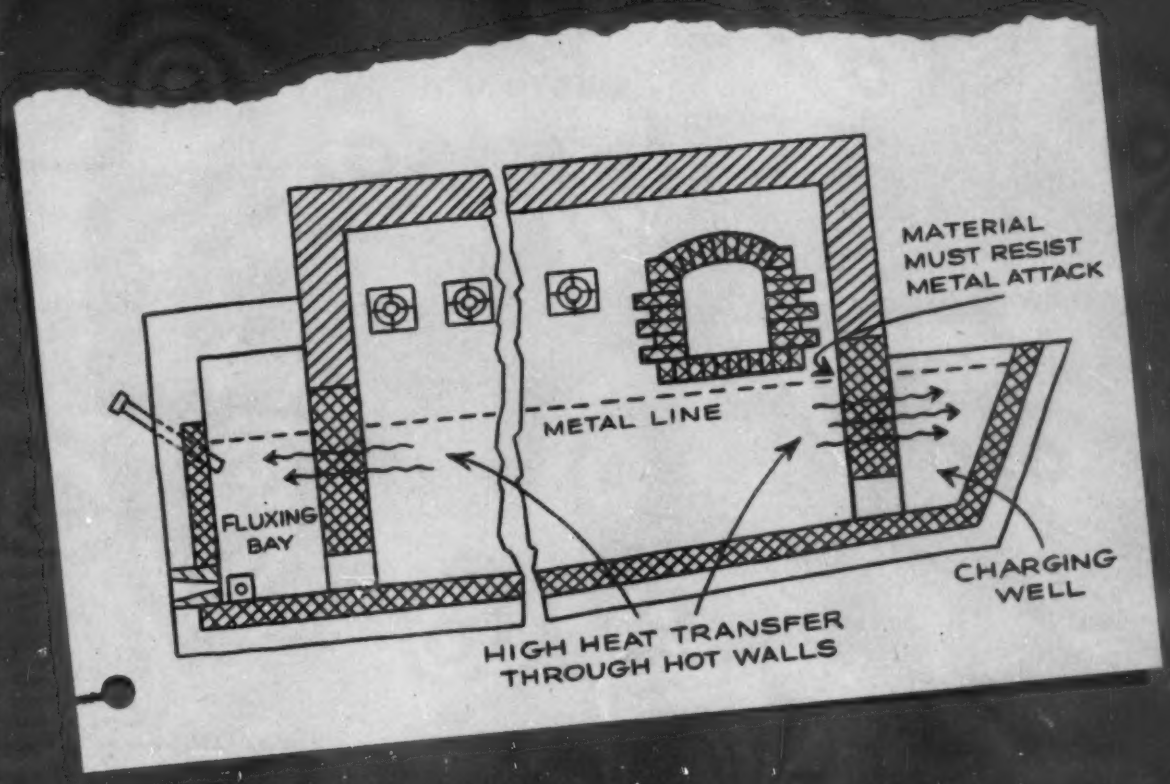

Design hints on refractories for aluminum furnaces

Hot-wall construction facilitates melting and refining

The aluminum melting furnace sketched above capitalizes on the advantages of high thermal conductivity material in the hot walls to facilitate melting and refining.

The hot walls, built of CARBOFRAX® M silicon carbide brick, transmit heat to the charging well and fluxing bay 12 times faster than fireclay. In addition to superior heat conductivity, CARBOFRAX brick have the necessary structural and physical properties to withstand penetration, attack and corrosion by molten aluminum, thus extending furnace life. The walls are also easy to clean and maintain.

Special-purpose refractories made by Carborundum offer a choice of materials to meet widely varying needs in all critical areas of aluminum melting furnaces.

CARBOFRAX *ceramic-bonded silicon carbide,* for example, is made in a variety of compositions suitable for hot walls, side walls, bottoms, charging ramps and door jambs and sills. REFRAX® *silicon-nitride-bonded silicon carbide* can be supplied in accurately dimensioned shapes with high strength and resistance to thermal shock. It is not wet by molten aluminum. Applications include launders, troughs, spouts, tapout blocks, stoppers and pyrometer tubes. Special uses are found in furnaces subject to intermittent operation. ALFRAX® *fused alumina bubble insulating brick* are light in weight, withstand high temperatures and have the low heat transfer qualities needed in walls and roofs above the metal line. MULLFRAX® *electric furnace mullite* resists flame erosion and spalling, has low heat transfer. It is widely used for burner blocks.

For assistance and recommendations on how to engineer refractories to your specific furnace needs, contact Dept. R-80. Refractories Division, The Carborundum Co., Perth Amboy, N. J.

For engineered refractories . . . count on

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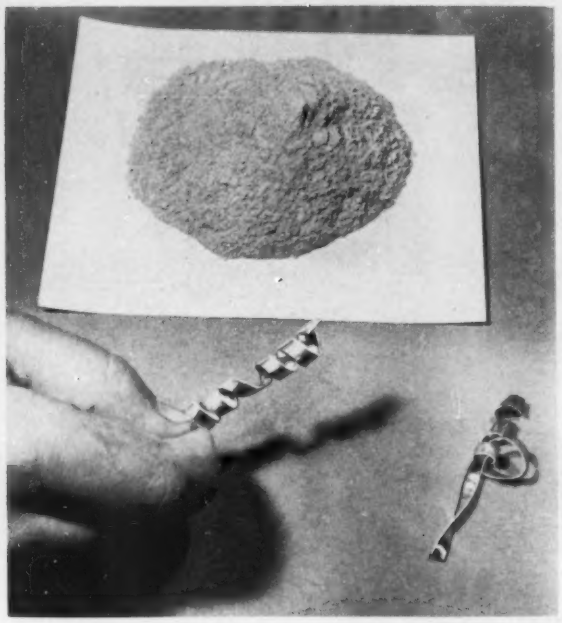
CASTING ABOUT

technical news of applications & process involving precision metal molding

DUCTILE REACTOR MATERIAL FROM SINTERED POWDERS



BINAL STRIP made from the powder shown is highly ductile.

The combination of a metal and a metal oxide can be made by powder metallurgical techniques. But usually such a mixture is not workable, either hot or cold, into rod and strip form.

Now an homogeneous mixture of aluminum and rare-earth oxides or aluminum and boron can be made which is easily worked. These materials are useful for control purposes in nuclear reactions.

An advanced powder metallurgical technique has been developed by the Sintercast Div. of the Chromalloy Corp. The products can be made to full density and frequently equal pure aluminum in ductility. An example is Binal, boron carbide uniformly dispersed in an aluminum matrix. The material can be produced in a continuous strip which may be wound into coils and cylinders, or made into other shapes.

The process is applicable to compositions containing up to about 30% (by volume) of dispersoid, usually an oxide, carbide, boride, or intermetallic compound. The mixtures can be made to precise composition because there is no loss due to melting and casting. Composition accuracy to $\pm 0.01\%$ can be held.

A further advantage from powder metallurgy is the purity of the end product, much better than can be held with melting and alloying methods.

SPRAYED METAL FOR PROTECTION DURING HOT WORKING

Unless a protective atmosphere is used during the heat-treatment and hot working of metals, many of them suffer high losses due to oxidation. Now a protective coating is available which stops oxidation losses, acts as a lubricant, and is easily removed when fabrication and heat-treatment are completed.

The process is to spray either copper or aluminum onto the metal being worked. When heated, the sprayed coating forms a tight, impervious oxide film which protects the base metal.

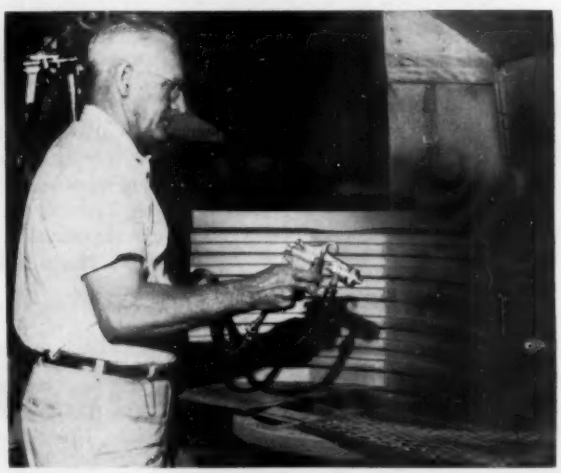
Many close-tolerance parts previously were rejected because of metal loss from 0.002" to 0.012" during stress relieving. With the new precoat, loss of material is held to 0.0001" to 0.005".

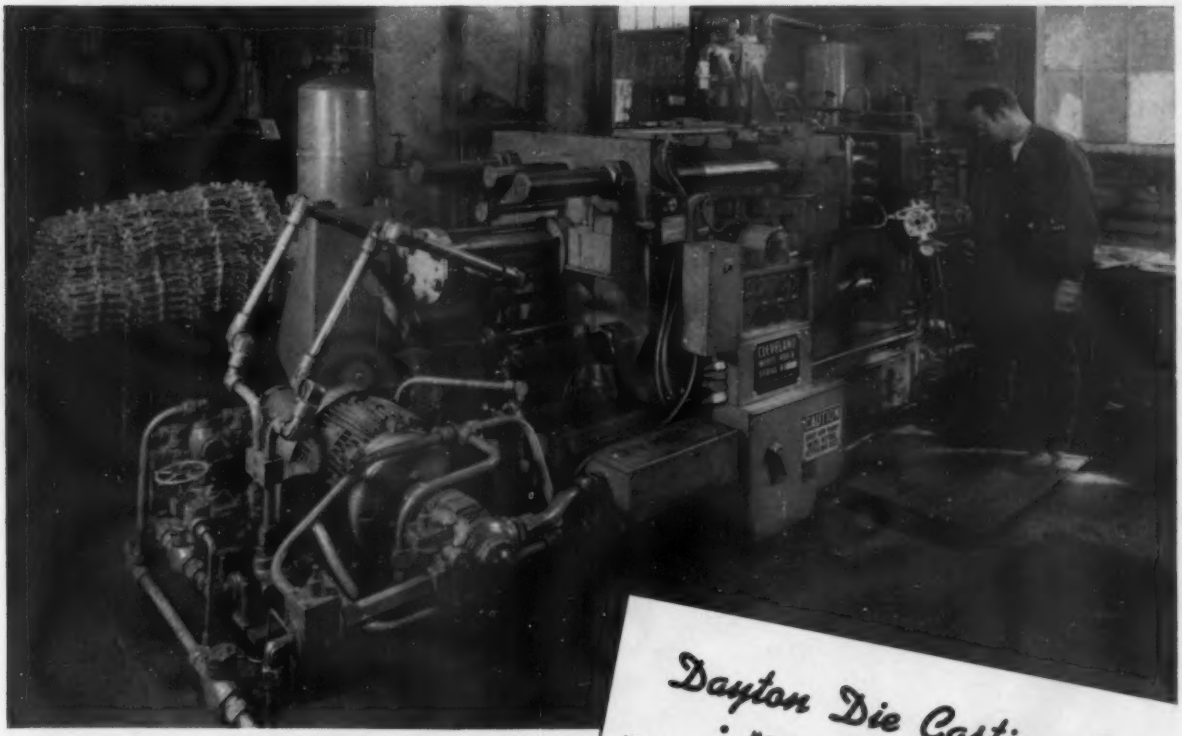
The process is valuable for ferrous metals and alloys and the newer "space-age" metals such as beryllium, columbium, molybdenum, rhenium, tantalum, tungsten, vanadium, and zirconium. It is also useful on nickel base alloys.

The only limitation is that neither the aluminum or copper coating should alloy with the base metal during hot working or heat-treating. In some cases, the metal oxide may be sprayed onto the part instead of the metal. An organic vehicle is used as a carrier and is burned off during heating.

When an aluminum oxide film is used the maximum working temperature is 3722°F. with copper oxide the top temperature is 2255°F.

The process was developed by the Aeronautics Div. of Chance Vought.





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• Manufacturers of DIE CASTINGS •

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BAldwin 8-7812

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Yours very truly,
DAYTON DIE CASTING COMPANY
General Manager

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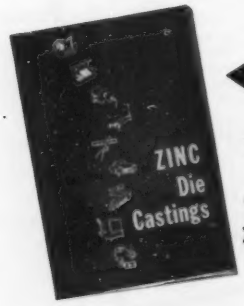

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A New Company Serving the Die Casting Needs of Industry.

Southern Die Casting and Engineering is all new . . . from its specially constructed building to the modern, high tonnage machines inside. ■ A broad, new scope of die casting services is available to you through specialization in castings of zinc and aluminum alloys, and through the revolutionary Vibrocast Process, which Southern Die Casting and Engineering originated. ■ An experienced team of specialists stands ready to serve your needs for designing, engineering, die making and casting. Let John A. Weber, manager, show you how this vital, new company can serve you. Write, today!

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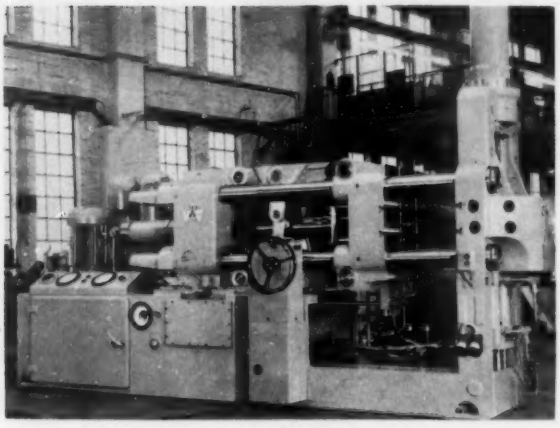
NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards. You'll find them facing page 56 of this issue



HIGH SPEED DIE CASTING MACHINE

ERIC P. CAHN—This 200-ton VWF die casting machine is part of a new line of push-button controlled machines suitable for all non-ferrous alloys. Interchangeable casting heads allow cold or hot chamber operation. High speed injection permits fast production and the casting of thin sections. Maximum specific injection pressure is 33,000 psi, and locking forces range from 50 to 800 tons. It produces castings with high density and strength, low porosity, and smooth surfaces. Rejection rates are low, even on intricate pieces. Features include automatic cycling, hydraulic core-pull equipment, central lubrication and electrical interlocking of all movements.

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EXTRUSION PRESS SHIELDED WORK AREA

SUTTON ENGINEERING CO.—The working area in this 600-ton horizontal hydraulic extrusion press can be completely shielded for operation in an inert atmosphere. This solves some of the problems in the extrusion of nuclear materials. Control is from a pulpit with all functions visible to the operator. The press has a minimum of dead cycle time, and all parts are easily accessible for maintenance.

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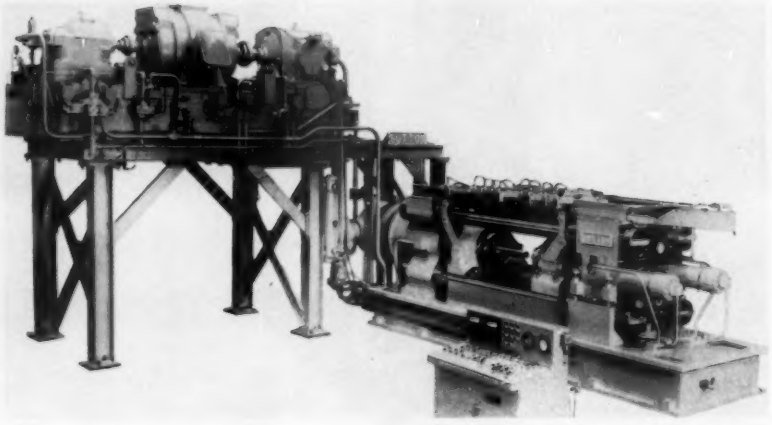

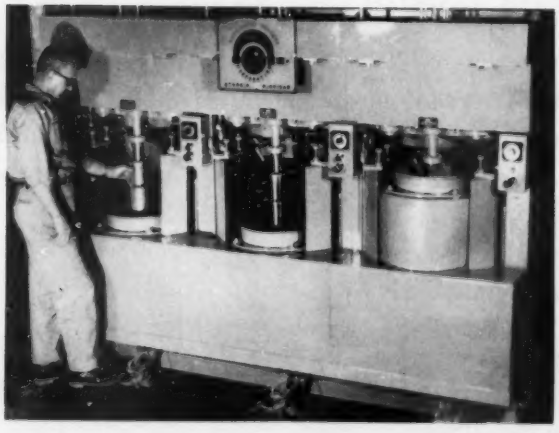

NEW TYPE FINISHING MACHINE

MECHA-FINISH CORP.—The VO Mechamatic finishing machine was developed specifically to deburr and finish cylindrical-shaped parts requiring work on both the inside and outside dimensions. Features include a vibrating media tank combined with a part spindle oscillating radially at high speeds. Fixturing is air-actuated and can be changed easily to accommodate various components. In the application illustrated, a diesel engine cylinder sleeve is being deburred, honed and radiused while maintaining a specified microinch surface measurement. One man tends 6 spindle stations with nearly 100% efficiency.

Circle No. 237 on Reader Service Card

continued on page 68

You get speedier service from the

ZINC ZONE

Central location of American Zinc plants assures prompt deliveries of slab zinc to any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
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Press the button, that's all! The Ajax Magnethermic Billet Heater delivers a billet at exact temperature to the extrusion or forging press.

THE NEW NAME WITH THE FAMILIAR RING!

60 Cycle Induction Billet Heaters manufactured by AM... one of our many products for induction heating or melting of all types of metals.

"induction heating is our only business"

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YOUNGSTOWN DIVISION
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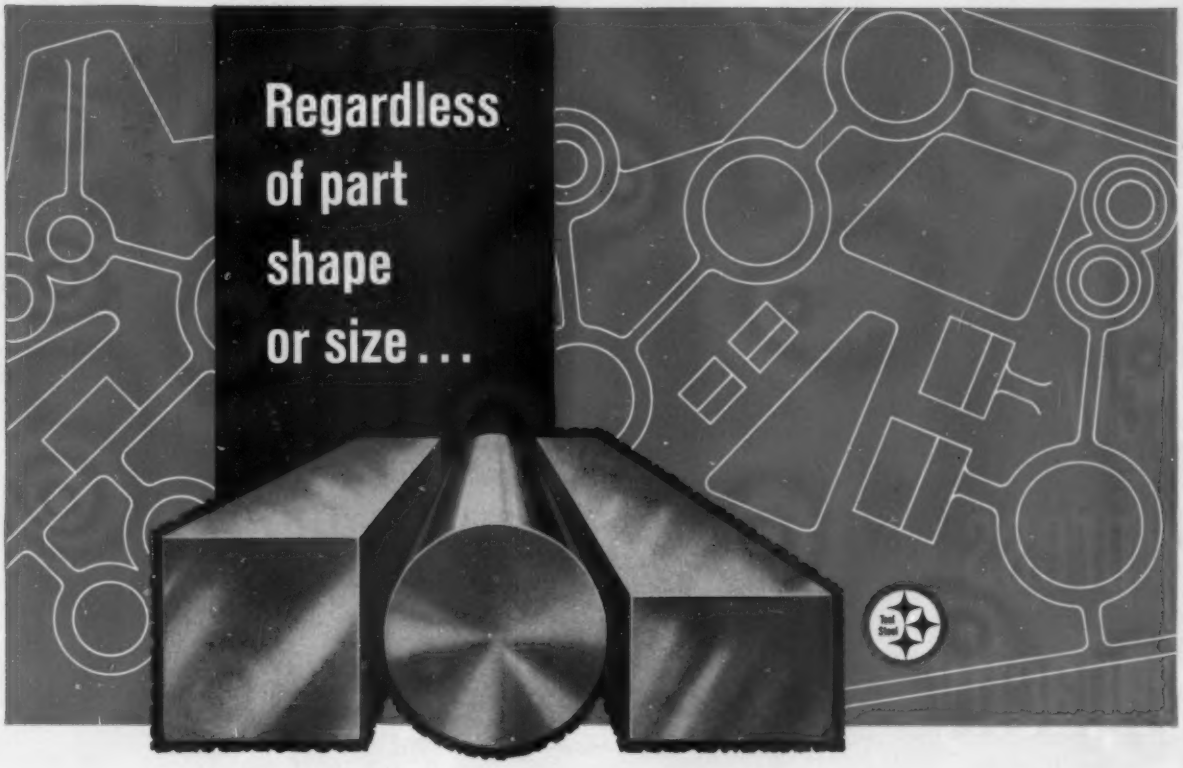

Dependable . . . VDC hot work die steel

means *Better* die casting dies

Send today for VDC data sheet

Part shape or size presents no problem when you use Latrobe's VDC (Type H-13) hot work die steel. Easy to machine, VDC possesses excellent non-deforming characteristics and can be uniformly hardened to give ultimate resistance to wash and erosion when in service. In addition, the high vanadium content in VDC makes it ideal for magnesium or aluminum alloy die casting service in temperature ranges up to 1200 °F.

Other advantages of VDC include sound internal structures guaranteed by Reflectoscope inspection . . . freedom from porosity . . . superior impact strength . . . and a wide range of stock sizes located at nearby Latrobe Steel Service Centers for immediate delivery.

Call your Latrobe representative . . . specify VDC for *your* next die casting die.

Manufactured by skilled American labor.

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Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

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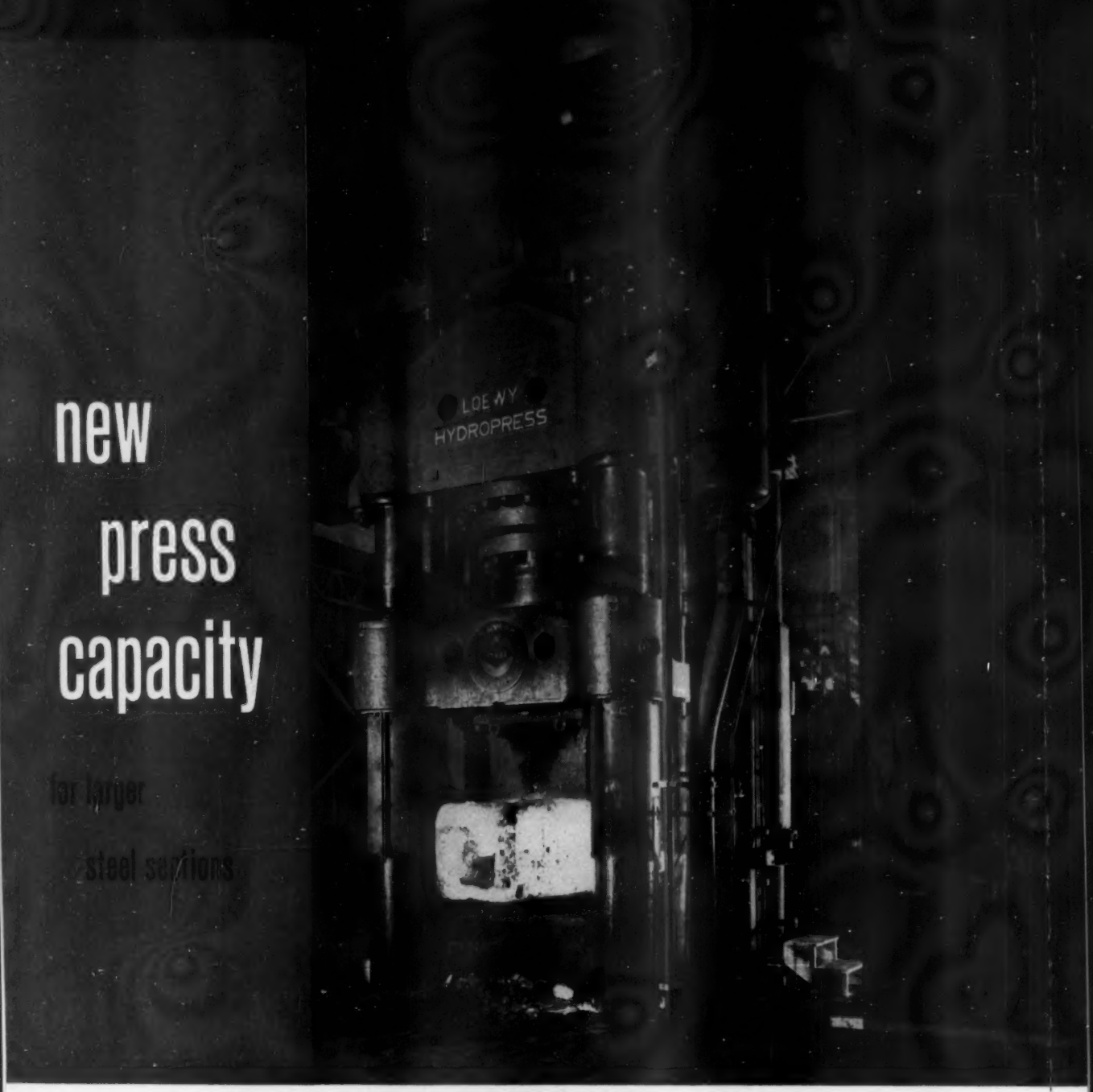

new press capacity

for larger steel sections

serving better production of our first quality tool steels

(and our customers' special forging needs)

CAPACITY	2000 Tons
WORKING PRESSURE	4250 psi
STROKE	48"
DAYLIGHT	108"
COLUMN CENTERS	
(left to right)	90"
(front to back)	52"

2000 tons of new Vanadium-Alloys Steel press capacity is here at work—speeding delivery of more uniform large forgings in our regular production, and ready to meet special custom forging demands. Ingots from 12" square to 40" square are regularly worked. Let us quote on your block, disc and special forging requirements in First Quality tool steel grades.

Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

DIVISIONS: Anchor Drawn Steel Co. • Colonial Steel Co. • Metal Forming Corporation • Pittsburgh Tool Steel Wire Co.
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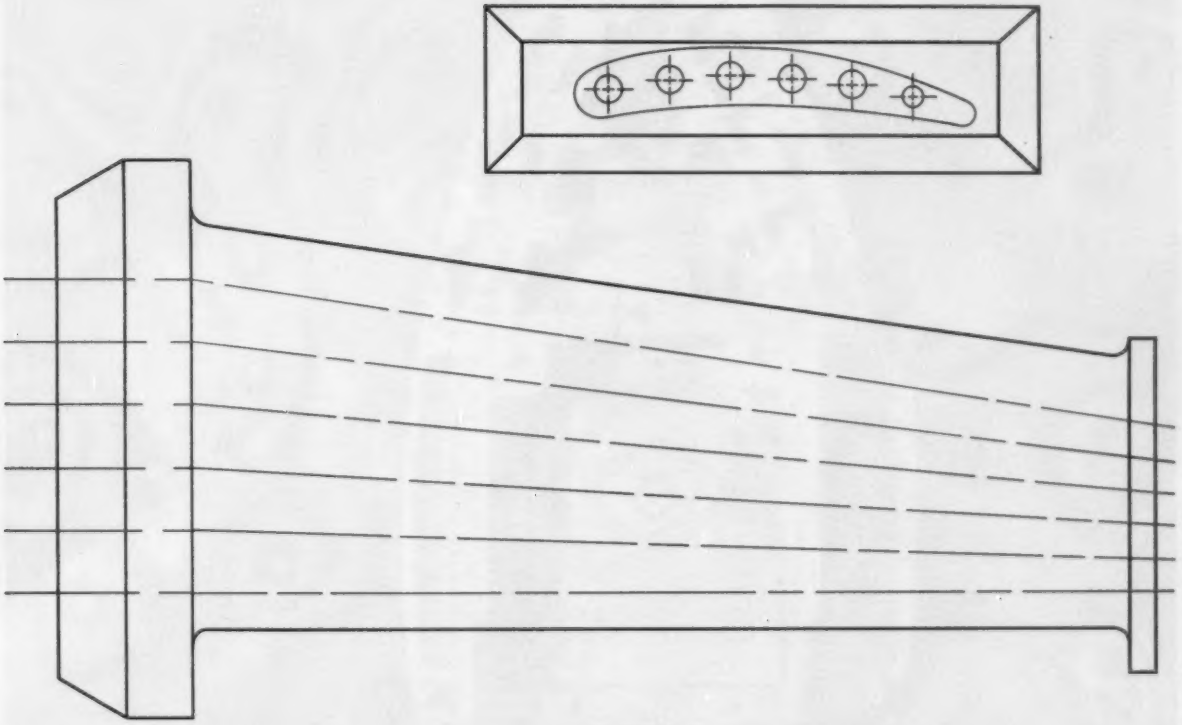


How to make precise holes WITH GLASS

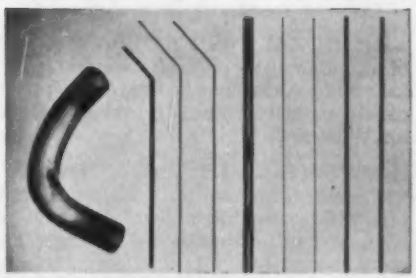
The holes in castings like this can be made with glass. It's a special VYCOR *brand* 96% silica glass we developed especially for metal casting.

You can use it as precision coring in high-temperature metal castings without having it melt or lose its shape. The exceptionally low expansion of the glass and its resistance to thermal shock make it possible to speed up the working cycle.

You simply put a tube of the right dimensions into your wax pattern. Send the pattern right into your mold production cycle. After casting is completed, the glass can be removed by leaching.

You can get the core surfaces either smooth or frosted. We can give equally tight tolerances on angles, curves, bends or any combinations of these.

Send for information sheet Write for number IC-6 for full line and specs, including stock wall tubing from 6 to 90 mm O.D. Address: Industrial Components Department, 47 Crystal Street, Corning, N. Y.



TOLERANCES on special core tubing run like this:

O.D.	TOLERANCE	BOW
.005 to .020″	.001″	.0006 in/in
.020 to .070″	.002″	.0006 in/in
.070 to .160″	.003″	.0006 in/in

Nominal O.D. to wall ratio is 3:1

CORNING GLASS WORKS

CORNING MEANS RESEARCH IN GLASS

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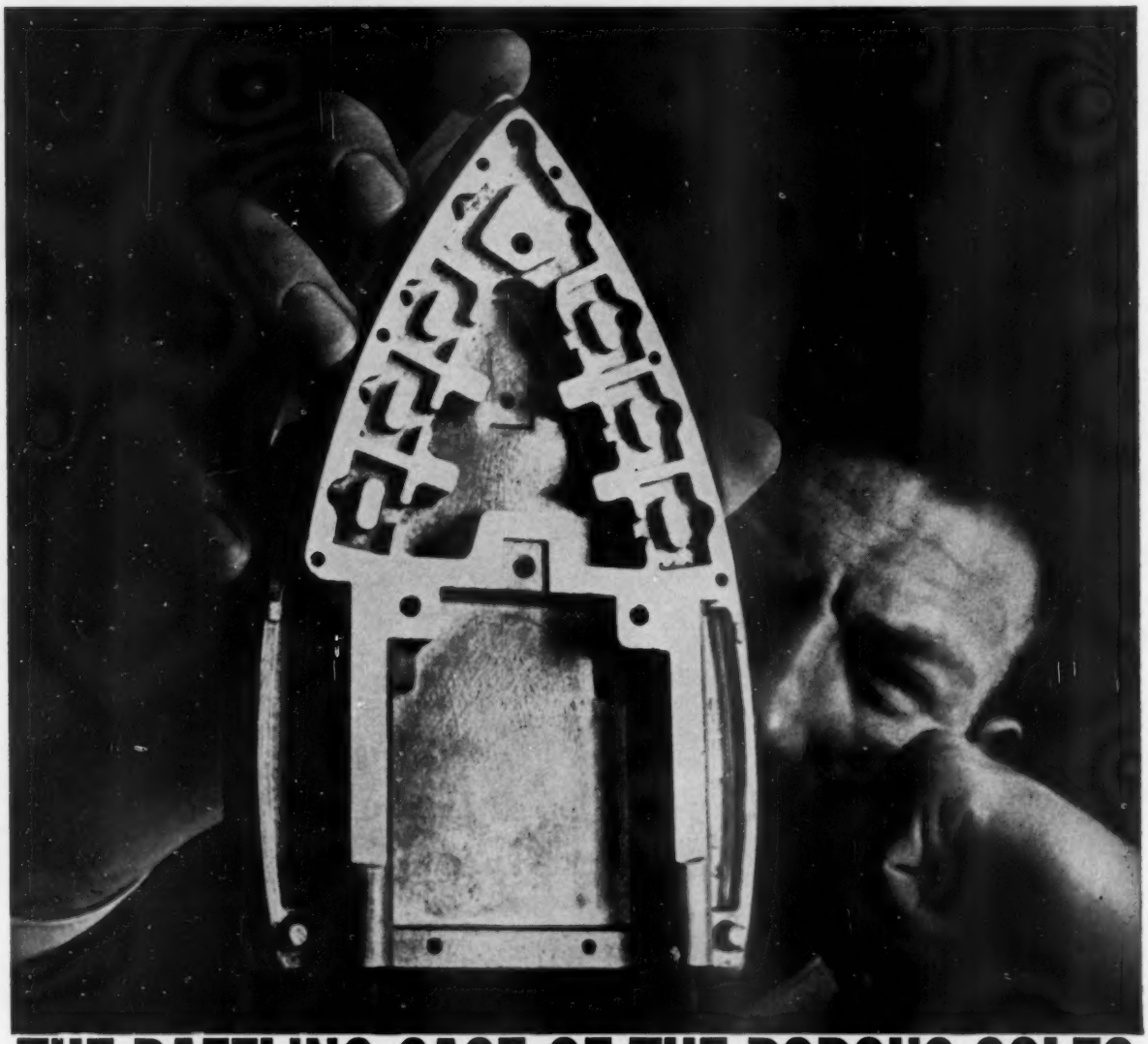

THE BAFFLING CASE OF THE POROUS SOLES

Another costly mystery—solved by the man from Kaiser Aluminum

THE PUZZLING FACTS. A certain manufacturer of aluminum sole plates for electric irons was knee-deep in trouble. As soon as he began using his new permanent molds, porosity became a problem. Rejects were piling up. What to do?

HOW THE CASE WAS SOLVED. A phone call was made. The man from Kaiser Aluminum came and put his finger on the problem: shrinkage porosity (caused by improper feeding of the casting). The solution was quickly reached by (1) readjusting thermal properties in the die, (2) by varying the die coatings, and (3) altering the gating system to allow proper feeding of the casting.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He'll give you expert advice on any casting problem—including conversion from cast iron to aluminum, mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FOR PIG AND INGOT with a free sleuthing bonus, call your nearest Kaiser Aluminum sales office or any of the distributors listed on the opposite page.

FREE TO FOUNDRY OFFICIALS
Send now for free booklet giving complete information on Kaiser Aluminum's new high-strength, high-purity aluminum alloy. Includes specifications, properties and production advantages. Write: Kaiser Aluminum & Chemical Sales, Inc., Dept. PI-239, Kaiser Center, Oakland 12, California.

KAISER ALUMINUM

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult local TV listing

Circle No. 69 on Reader Service Card

POROSITY PROBLEMS?

Your Kaiser Aluminum ingot distributor is more than a nearby source for aluminum pig and ingot. He's ready to render specialized advice on anything from alloy selection to fabricating methods. And "Service" is his middle name!

CALL YOUR NEAREST

KAISER ALUMINUM

INGOT DISTRIBUTOR:

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Gulf Reduction Corp.
WAlnut 6-2425

LOS ANGELES, CALIFORNIA
Aaron Ferer & Sons, Inc.
MAdison 5-1553

PHILADELPHIA, PENNSYLVANIA
George Sall Metal Co., Inc.
Pioneer 3-2828

SEATTLE, WASHINGTON
Materials Reclamation Co., Inc.
PArkway 2-0133

PMM LETTERS

the readers' forum

VACUUM DIE CASTING

Would you be so kind as to let me have as much data as possible on vacuum die casting systems and any other relevant information with regard to vacuum systems in general?—K. G. G., diecasting engineer, South Australia.

Almost every practical vacuum die casting system has been covered in some detail in past issues of PMM. For the most part, the systems now in use have either been purchased from one of the major die casting machine builders or are home-made. This reader has been referred to several machine builders as well as to back issues of this magazine.—ed.

PROCESS INFORMATION

Please send us any information you may have on sinterings, investment castings, and shell molding. —A. B., purchasing agent.

We have a cumulative index of articles which have appeared in PMM from Sept., 1951 to Dec. 1958. This index is broken down by process. A copy of the index has been sent to this reader. A few copies are still available and will be sent to anyone interested. Also, the index will be brought up-to-date in December of this year so that it will be a ten year cumulative index.—ed.

BIG SINTERINGS

We are designing a part which we would like to have made in sintered iron. Larger parts similar to this presently being manufactured by us, are made from a nodular iron casting and are expensive to machine.

The part involves a slotted cylinder of about 5" diameter and up to 8" to 10" long.

We would appreciate your giving us the names of some firms that have equipment large enough to produce this part.—R. M. R., Jr. design engineer, special products section.

continued on next page

"the HITCHINER way..."

cut costs two-thirds by INVESTMENT CASTING

These roller mounts, used on a precision skin-grafting machine, guide rollers which regulate the depth of the skin graft. The material used must withstand the high temperature of sterilizing and the corrosive elements of human blood.

The user of these stainless steel roller mounts once thought they could only be made by machining of stainless steel bar stock. Hitchiner's "Engineered Quotation" showed they could be investment cast, not only in the necessary alloy and without design changes, but with considerable savings.

The use of investment casting meant five times greater production without highly-skilled labor, a one-per-thousand reject rate, and a per unit cost of a third that of machined parts.

This wide freedom of choice in alloy, as well as flexibility in design may help you with your parts manufacturing problems. Try "the Hitchiner way" yourself and send us a sample or blueprint for our "engineered quotation" — no obligation.

Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure on the latest investment casting methods.

HITCHINER
MANUFACTURING COMPANY INC.
MILFORD 24, NEW HAMPSHIRE

Coast to Coast Engineering Representatives

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SHORTCUTS to MARKING

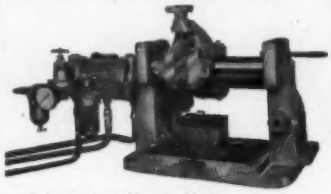
ACROMARKER NAME-PLATE STAMPING MACHINES

40 Characters all interchangeable. Standard sizes range from 1/16" to 3/8". Write for Color Folder.

No. 1F

No. 1

Model 9
PNEUMATIC MARKING MACHINE

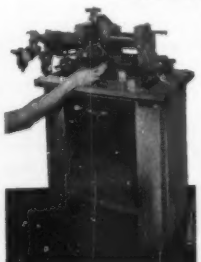


A low cost marking machine powered by your regular air line 75 psi. and over. It marks parts, tools, sleeves, etc. of steel and also marks plastic with slight additional assembly. Write for Catalog No. 9.

No. 2A NAME PLATE STAMPING MACHINE
• Automatic •

Performs all operations including serial numbering. Slide feed provides absolute safety. Write for Catalog No. 1 & 2A.

PERIPHERAL MARKING MACHINE
Model 9AH



Marks precision calibrations and graduations around dials. Uses flat dies to mark round and roll dies to mark flats. A high production machine that will not break even brittle plastic parts. Write for Catalog No. 9AH.

Write for New Pocket Catalog and Price List—NOW!

The ACROMARK Company

426 Morrell St., Elizabeth 4, N. J.
"The original Marking Specialists"

Circle No. 1 on Reader Service Card

LETTERS *continued*

The names of companies that can possibly make this part have been sent. While this is a larger than usual part to be made from iron powder, it points up strongly the one great growth factor that PMM has been emphasizing for almost nine years. The great field for growth of the powder metallurgy industry is in the replacement of iron castings on which considerable machine work must be done. There's a vast tonnage of these castings made every year. Many, if not most, of them can be converted to sinterings if a bit of aggressive selling is done.—ed.

STEEL INSERTS

Will the article "Bonding Aluminum to Steel" starting on page 45 of the June, 1960 issue of PRECISION METAL MOLDING be offered as a reprint in its entirety?

If and when available, we would appreciate three copies for our several engineering departments.—D.S.P., purchasing agent, purchasing research section.

At the moment, we don't plan to reprint this article unless there is a greater demand for copies than we can supply with tear-sheets. Three tear sheets of the complete, two-part article have been sent.—ed.

DIRECTORIES

In the past you have published a directory of die casting companies.

Do you, also, publish a directory of permanent mold castings?

At the present time a Chicago foundry is our only source for critical aluminum permanent mold castings. However, the government requires that we have at least one second source. We require a foundry that has the facilities for Zy-Glo penetration, heat-treating, X-raying and also the very finest of inspection equipment.

Any information you can give us will be greatly appreciated.—H. B. S., purchasing manager.

We do not publish a directory of permanent mold foundries. However, we have sent this reader the names of several foundries that are qualified to make and inspect castings for government contracts.—ed.

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KERR
investments
AND SAVE MONEY TOO!

Modern manufacturing equipment, rigid quality control, assures uniformity from batch to batch.

KERR investments will fit your needs and cut production cost.

For Non-ferrous Metals

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- **DURACAST**
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pure nickel for critical alloying

When the specifications call for *pure* nickel, you can count on Sherritt as a reliable source of supply. Sherritt's unique hydrometallurgical refining process yields nickel powders with a purity of 99.9%. This high-purity nickel comes to you in handy briquettes and in three grades of powder for faster, easier alloying. The low chilling property of Sherritt briquettes and powders makes them particularly desirable for alloying additions at the end of the heat. Special nickel grades and coated powders are also available. FOOTE MINERAL COMPANY *is the exclusive sales agent for Sherritt nickel and cobalt in the United States and Canada. For complete illustrated brochure with prices and delivery information, contact the Foote Mineral Company, 474S Eighteen West Chelten Building, Philadelphia 44, Pa.*

SHERRITT GORDON MINES LIMITED

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NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

PRECISION CASTINGS CO. IS HOST TO ITS SUPPLIERS

WEIGOLT

BRAMMER

A luncheon, unique in the die casting field, was held in Cleveland when Precision Castings Co. was host to more than 60 of its suppliers. Instead of "buttering-up" the customers and prospective customers, Precision decided to say thanks to the suppliers of equipment and raw materials.

Precision Castings Co. is one of the largest custom die casting companies in the country. At present they operate two plants, one in Cleveland and the other in Fayetteville, N.Y. Each plant is completely integrated and operates as an independent unit. The two plants have a marketing area of about 24 states. Present plans call for expansion of both plants with more equipment to be added in Fayetteville and both buildings and equipment in Cleveland. Secondary expansion plans look toward a new plant in the south and another one west of Chicago.

Al Weigolt widely known and respected in the die casting industry is vice president of Precision and general manager of the Cleveland plant. William N. Brammer, also a company vice president, is in charge of marketing for both plants.

The experience available to the company's customers is best shown by the top 40 employees of the Cleveland plant who have a total of 1120 years experience in the die casting industry.

Precision Castings' executives emphasize that the company is fully equipped and prefers to do complete jobs—that is, casting, trimming, machining, and surface finishing. In that way there is no division of responsibilities. In addition to full equipment for all of these phases of production, the company has vacuum casting equipment available for those jobs which require it. The Fayetteville plant has facilities and experience for casting magnesium.

INVESTMENT CASTING INSTITUTE DESIGN CLINIC A SUCCESS

Knowledge of how to design for investment casting is the best salesman for wider use of investment cast parts. At least this is the thinking of the Investment Casting Institute, national trade association.

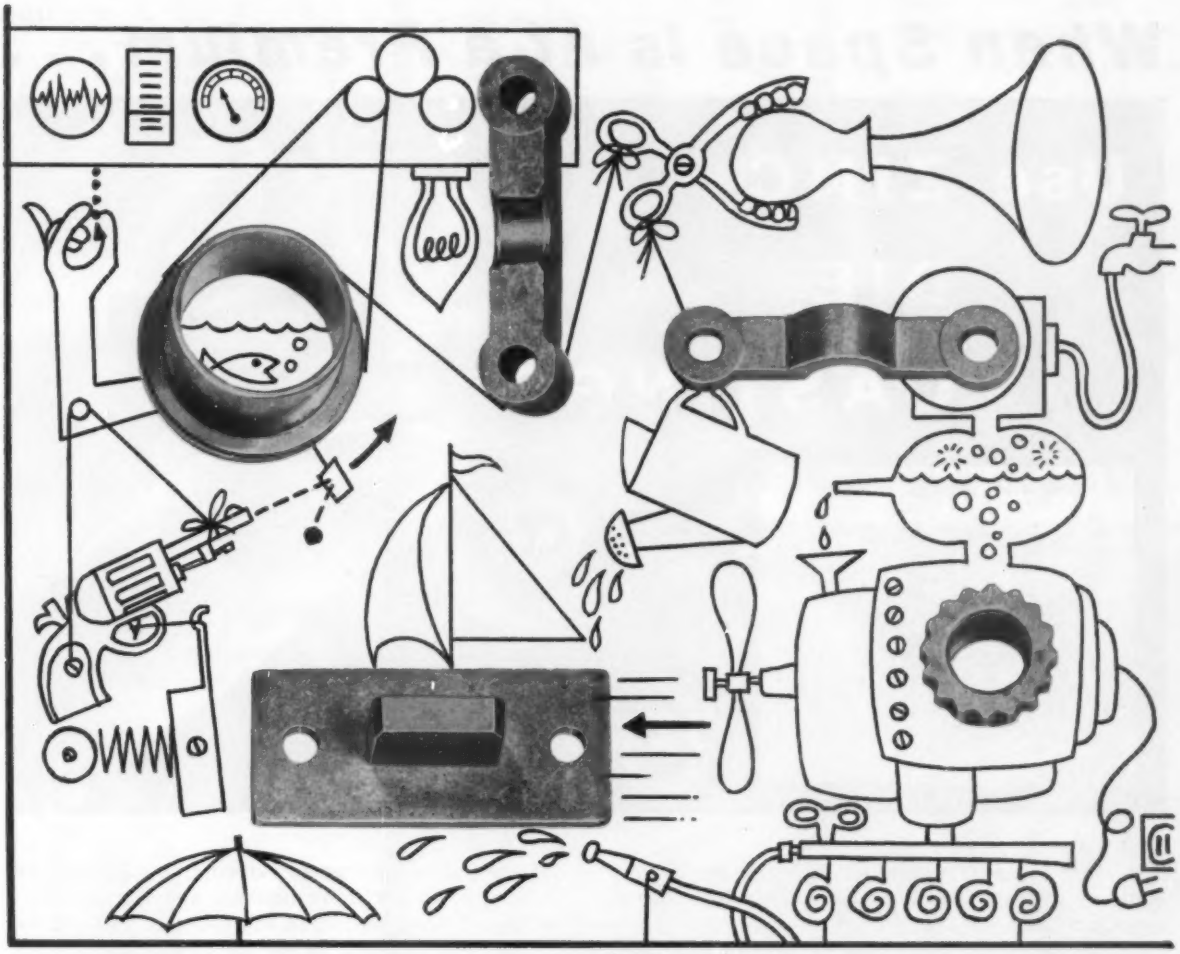
The interest in getting more design knowledge was amply demonstrated at the last design clinic held in Newark, N.J. last May. At this session, design engineers heard industry experts discuss many design problems and at the workshop sessions the questions indicated a lively desire for more knowledge.

Next November 1st, at Hotel North Park in Chicago, another design clinic will be held. While speakers have not yet been assigned, the subjects to be covered will be: Designing for Lowest Cost, Investment Casting Applications, The Economics of Tooling, New Developments in Alloys For Investment Casting, and Recognizing Investment Casting Applications For Cost Savings.

The November Clinic will allow plenty of time for discussion of individual problems.

more industry news page 59

THE ICI CLINIC last May drew a large crowd of both industry men and design engineers.



This thing wouldn't run when we plugged it in,

BUT, WE'D LIKE TO SEND YOU THE PIECES*

. . . to introduce you to parts made from superior Glidden Resistox Metal Powders.

You may find that metal powder parts similar to these, or perhaps in entirely different form, can mean substantial savings in manufacture of your products.

Glidden Resistox Metal Powders are prepared by a special process which removes *all* soluble salts, resulting in pure, stable powders for highest finish, appearance and performance characteristics.

Glidden is the world's largest blender and can produce up to 30,000 pounds of powder in a single batch —an important factor in complete uniformity of mass-produced parts.

As a leading supplier of metal powders, Glidden works closely with parts producers. This places the combined training and experience of several staffs of metallurgists and technicians at your disposal.

**Write on your letterhead for sample parts package and further information on powdered metal products.*

QUALITY Glidden PRODUCTS

RESISTOX METAL POWDERS

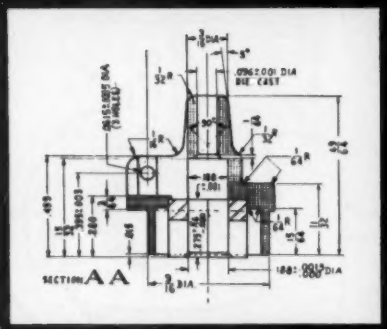
The Glidden Company
Chemical Divisions, Metals Department
Hammond, Indiana

COPPER POWDER • LEAD POWDER • TIN POWDER • BRASS POWDER • ALLOY POWDER • FILTER POWDER
CUPRIC OXIDE • CUPROUS OXIDE • CUPROUS SULFIDE • CUBOND COPPER BRAZING PASTE • COPPER PIGMENT

Circle No. 27 on Reader Service Card

When Space is at a Premium . . .

Use ZINC DIE CASTINGS



100 of these governors are die cast per hour.

Here is an excellent example of the design engineer's adjustment to the dictum: *In all business machines, space is at a premium.*

Used in a Burroughs desk-size adding machine, the miniature governor parts shown above had to be designed to fit into an extremely small space between the motor drive housing and the keyboard section. Consideration of the following factors led to the choice of zinc in the die cast design:

1. HIGH SPEED OF PRODUCTION

2. ABILITY TO HOLD CLOSE TOLERANCES

3. STRENGTH AND DURABILITY

The governors are cast in a two-cavity mold. After drilling and reaming the small holes, the parts are air-cleaned and assembled with steel pins and steel flyweights.

DIE CASTING is the Process . . . ZINC, the metal . . .

BUNKER HILL

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BUNKER HILL 99.99+% ZINC

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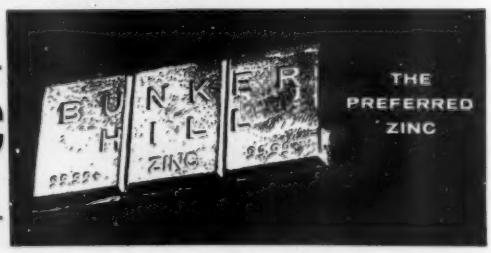
ZH-155



SERIES:

castmatic

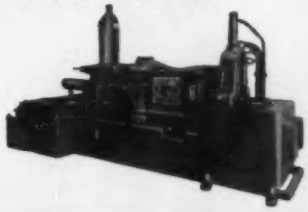
Automatic Control with pre-selecting panel for arranging up to 8 different working programs

VICKERS HYDRAULIC EQUIPMENT

SIEMENS ELECTRICAL EQUIPMENT

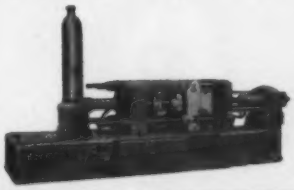
Model CASTMATIC Z/250
hot chamber type

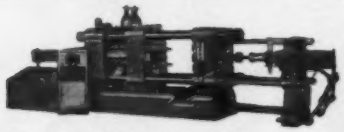
- Wedge Lock clamping system
- 275 short tons locking force
- 13.2 lbs. Zinc alloy, max. casting weight
- 600 dry cycles per hour



Model CASTMATIC 150
cold chamber type

- Toggle clamping system
- 165 short tons locking force
- 5.5 lbs. Copper alloy, max. casting weight
- 1100 dry cycles per hour





Model CASTMATIC 600
cold chamber type

- Wedge clamping system
- Central screw for adjusting platen daylight
- 660 short tons locking force
- 33 lbs. Copper alloy, max. casting weight
- 240 dry cycles per hour

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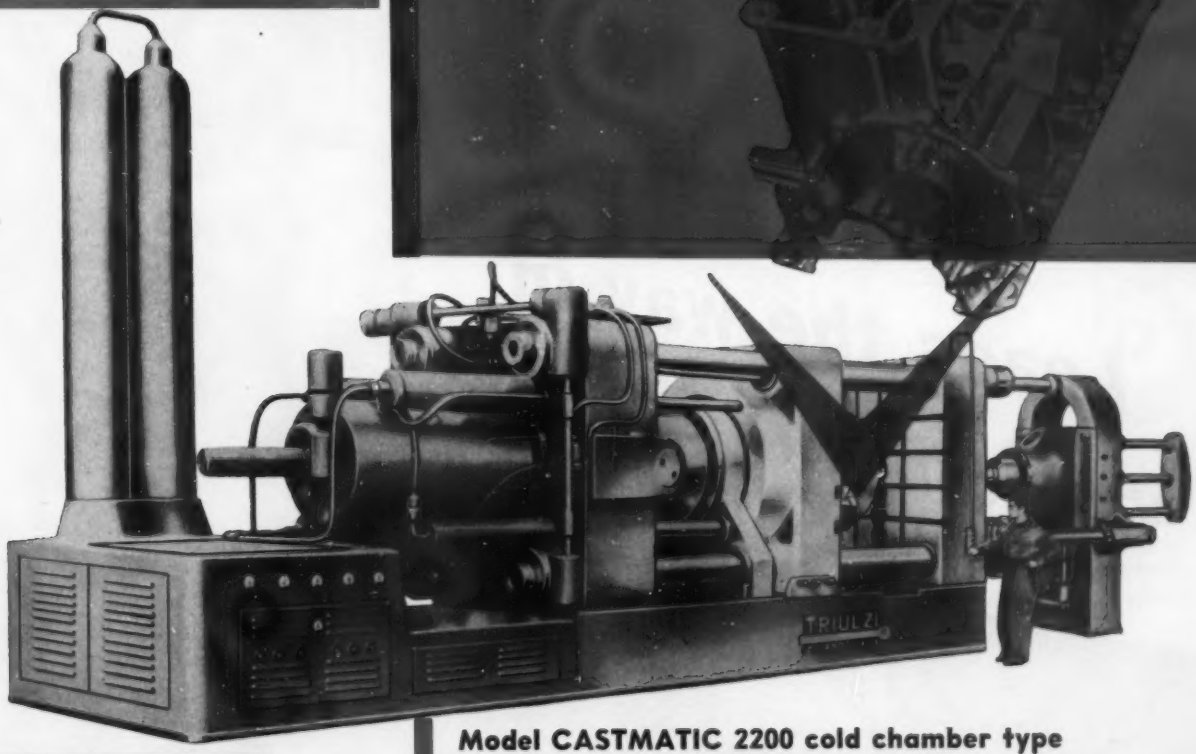

Model CASTMATIC 2200 cold chamber type

- Locked piston positive clamping system
- 2500 short tons locking force
- 110 lbs. Aluminum alloy, max. casting weight
- 98 1/2" max. open platen daylight
- 59" moving platen stroke
- 72 4/5" x 76 3/4" platen dimensions

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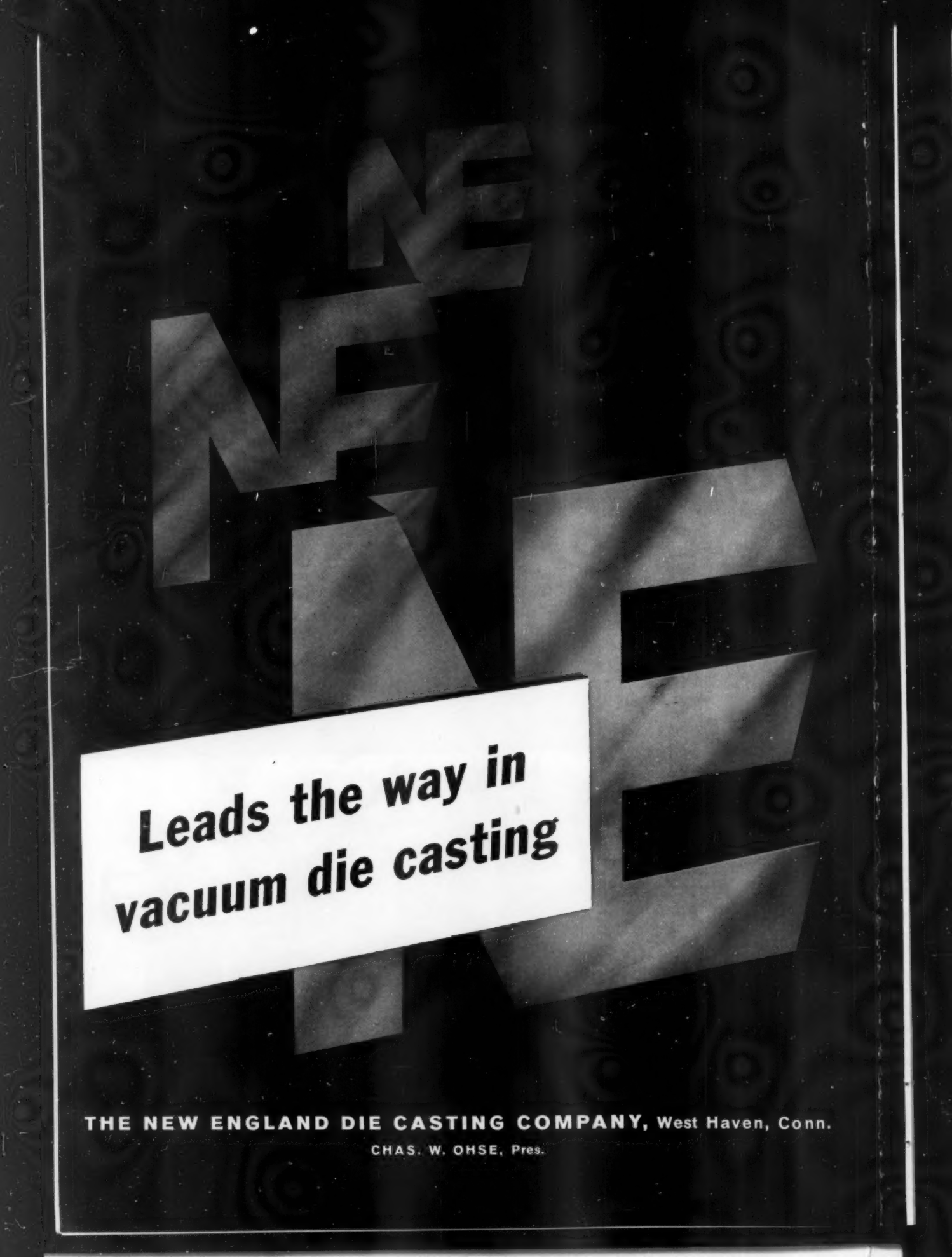
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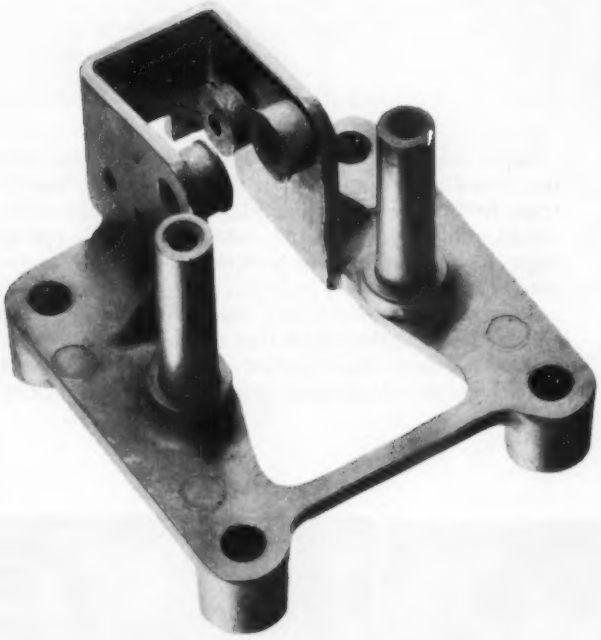
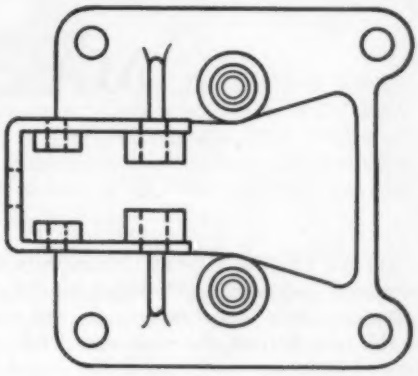
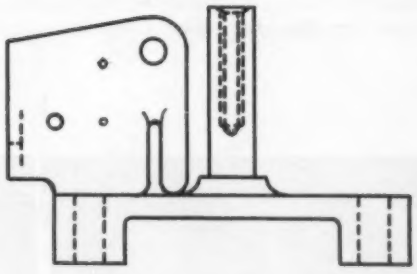
REDESIGN TO USE CASTINGS







ELEVEN SEPARATE PARTS were replaced with one die casting when the Jack & Heintz Co. redesigned a latch bracket in an electrical circuit breaker.

Originally, the bracket was assembled from steel stampings. However, the tolerance buildup and the lack of rigidity made it difficult to maintain a ±0.003″ tolerance on a critical 0.406″ dimension. Production men didnt' like it either. It was hard to make and assemble. Normal handling would often knock dimensions out of tolerance, causing a lot of reworking.

Then they designed the bracket as an aluminum die casting. This one casting replaced:

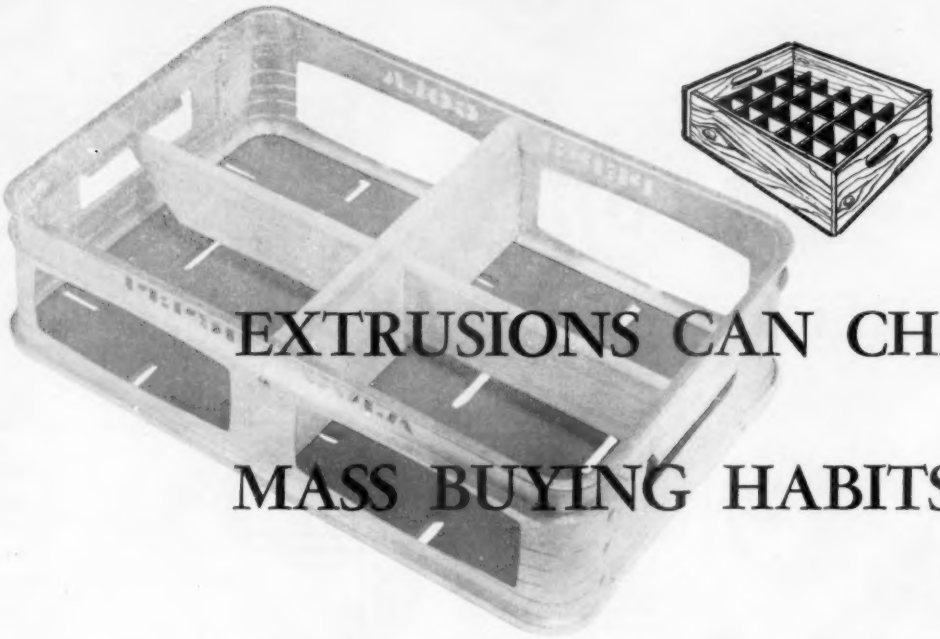
- A steel stamping formed by a difficult, progressive, five-stage operation
- Two die cast supports
- Two countersunk and staked screws
- Two machined studs
- Two bushings, spun in place
- Two spacers on the next subassembly

The die casting lowered direct costs 43%. This does not consider the reduction in inventory and the elimination of frequent reworking necessary with the steel stamping.

The designers found that the casting had the rigidity they wanted and minimized tolerance buildup. Production men found it easier to assemble to mating components. It withstood handling which would have damaged the steel stamping. Six thousand brackets have been used to date.

Empire Die Casting casts the bracket in non-heat-treatable 360 and 380 aluminum alloys. Jack & Heintz barrel finishes the part and anodizes it to military specifications. The only machining needed is stradle milling, drilling and reaming and tapping.

The latch that the bracket supports is a machined steel stamping. However, it needs too much precision grinding to get the required contour and 63 microinch surface. They are thinking of making the part as an SAE 4600 steel sintering.



EXTRUSIONS CAN CHANGE MASS BUYING HABITS

WHAT CONNECTION is there between the PMM processes and mass psychology? It's eye appeal. Make a package look better and people will buy more. This is the idea behind the new soft drink case with extruded aluminum sides being developed by Firestone Steel Products Co., Reynolds Metals Co., and the Pepsi-Cola Co.

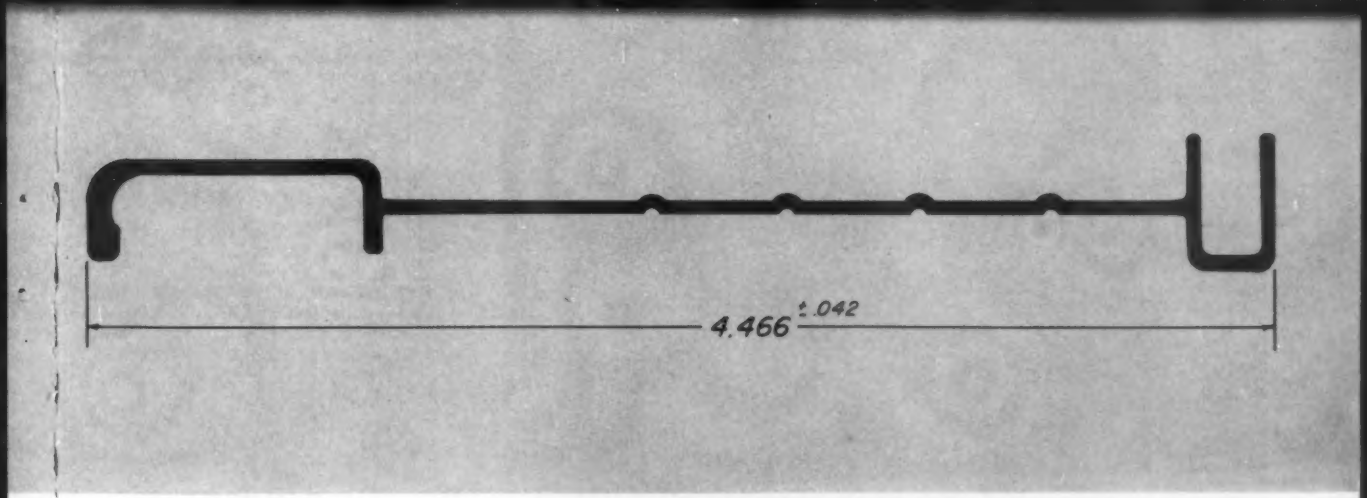
Two important factors to consider are that bottled soft drinks are sold mostly in 6-bottle cartons, and most families shop once a week.

Pepsi-Cola believes that if you buy a 6-bottle carton, you'll drink only six bottles between shopping trips. But, if you bought a 24-bottle case, your family would probably finish the case between shopping trips. In short, the more you take home, the more you'll drink.

Why don't customers buy more than the 6-bottle carton? Because they think that more than one carton is hard to carry and a bother to store. As for case purchases, the standard wooden case looks, and is,

ALUMINUM EXTRUSIONS for the side panels of the beverage case. The panel in the operator's hands has just been removed from the first operation die which trims, pierces, and punches, as shown.

THE SIDE PANEL, before forming, is deburred. After the extrusion has been trimmed and punched it is placed in a die which rolls the previously cut flap into a hand grip.



heavy. It frequently has splinters and nails sticking out to snag nylons or cut hands. It looks dirty, and generally is. Shoppers seem happy to leave them in the store.

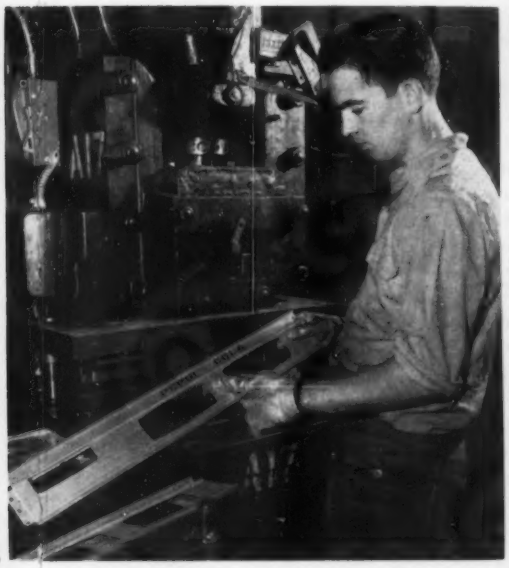
EXTRUSIONS TO THE RESCUE

Now substitute a smooth, clean, light-appearing aluminum case for the wooden one. The eye appeal is much better. It looks lighter since people just assume aluminum cases are lighter than wooden ones. If buyers think that there is only one light case to carry instead of several paper cartons, or a clumsy, dirty, heavy wooden case, then Pepsi-Cola in the new cases should sell well.

To take advantage of this phychological lever, Firestone's new case uses extruded aluminum sides. It has smooth, attractive lines and a light, bright, clean appearance. It catches the eye and reflects credit on the product. There is no reason to shy away from handling it. The customer shouldn't hesitate to set it on his automobile carpet or finely finished floor. He is more apt to buy an attractive case than an ugly, heavy, dirty one.

SIZEABLE MARKET AT STAKE

What does all this mean to the producers of aluminum and aluminum extrusions? As the new case wins acceptance, it will create an annual market for about 20,000 tons of aluminum extrusions. Although the original cost is 70% greater, maintainence and replacement savings will make the new case cheaper in the long run. However, the success of the aluminum case will depend upon its ability to sell more soft drinks. So far, 27,000 cases are in the field for evaluation.



THIS PANEL has just had the Pepsi-Cola name punched from the metal. The panel, as cut, represents one half the metal case, the halves are identical.

THE BOTTOM PANEL has been trapped in the extruded channel; the wooden separator has been installed, and the wrap-around case panels are being riveted.

FINISHED aluminum cases complete and ready for shipment. The light, attractive, appearance is evident even without the colorful cardboard cartons.

The new case's sales appeal is not yet known, but several other benefits are. It's cheaper to maintain because it needs no attention other than routine cleaning. Most of the larger distributors have several carpenters who do nothing but repair wooden cases.

The new case is slightly lighter than the wooden case, but delivery men say that the new one feels much lighter and is easier to handle. This shows how appearance affects a person's attitude toward a product. However, weight is not a real issue in the competition. The case weight is small compared to the glass and liquid weight in a loaded case.

Regardless of the extent to which the new case is adopted, it is a fine example of how imaginative designing can develop new markets for the PMM processes.

FABRICATION STEPS

Firestone Steel Products Co. builds the new case for the Pepsi-Cola Co. Firestone gets the extrusions in slightly oversize lengths. The first production operation trims the ends to length and pierces eight rivet holes, the side openings and handle. Die tolerances on this operation is $\pm 0.020''$. Next, the panel is deburred. The metal flap on the handle is rolled into a rounded gripping surface. Then the lettering is punched.

Rounded, right-angle corners are formed by a stretch bend, which amounts to wrapping the extrusion around a die. The legs are overbent 3° to allow for spring back. Tolerances are $+0°$ and $-3°$ on the long leg and $+5°$ on the short leg.

Slipping in the die is usually troublesome when forming two legs of unequal length with a stretch bend. A clamping force of around 110 tons is needed for this particular extrusion.

When metal channeled sections are bent beyond the elastic limit, metal flow must be dealt with. Since this extrusion has channeled sections, the metal puckered on the inside surface of the bend. Firestone brought the pucker to aceptable limits by relieving the die on the straight portions next to the bend. This lets the displaced metal flow away from the bend and into the straight portion. Tight die tolerances also help.

The only dimensional check needed after bending is on the length of the long leg; the tolerance, $\pm 0.050''$. This insures that all other dimensions are satisfactory. The extrusion is visually inspected for straightness and flaws.

The case is assembled by hand, but the process could be automated. Two extrusions (both sides are identical) are tacked together at one joint. A masonite bottom and wooden dividers are inserted, then the frame is closed and riveted. A hole is drilled in the middle of each long side and an expansion rivet inserted to hold the wooden dividers are inserted, then the frame is closed and riveted. A hole is drilled in the middle of each long side and an expansion rivet inserted to hold the wooden divider. Finally, the case is visually inspected and ready for delivery. No surface finishing operations are needed.

ACKNOWLEDGEMENTS

Material for this article was contributed by the Firestone Steel Products Co., Reynolds Metals Co., Pepsi-Cola Co., American Bottlers of Carbonated Beverages, and Bottling Industry Magazine.

1. W. B. PROSSER, left, president of Perfect Circle Corp. discusses design of the Speedostat with R. R. Teetor, former president and inventor of the device.

Ask your die caster how to...

TAKE FULL ADVANTAGE OF ZINC

WHY ARE SPEEDOSTAT parts made as zinc die castings? L. W. Payne, president of Ohio Die Casting Corp., who make the castings, said: "Investigation of the blueprints revealed a terrific opportunity for die castings, provided certain changes could be made to take full advantage of the economies offered by the process.

"One of our engineers spent several days with the customer's engineers. This arrangement enabled both the vendor and the customer to become fully acquainted with each other's problems and requirements. Both groups were then able to redesign for maximum economy and quality.

"Specifically, all but two dimensions were changed to reference from one side of the parting line. This eliminated the need of a machined reference surface. At this time it was evident that zinc would provide better control of cast dimensions with minimum draft, which in one place had to be held to within 0.004" in 1½ inches. Again zinc appeared to be the superior metal because space requirements dictated thinner wall sections than could be obtained with other metals. The secondary advantages of zinc are extended machine tool and casting die life. This has proven out in practice since no major tool replacements have been required from the middle of 1957 to date.

"With the part designs pretty much finalized, tool design was provided by our company to comply with the rather close dimensional tolerances. One important design feature places all ejector pin locations on

THE ADVANTAGES OF ZINC DIE CASTINGS FOR THE SPEEDOSTAT

- **The ability to die cast thin sections.**
- **Adequate strength.**
- **Maintenance of close tolerances.**
- **Ease of machining.**
- **Castable with minimum draft.**

the outside surfaces of the part to eliminate any possibility of flash entering the assembly.

"Redesign of the parts reduced all machining to simple drill press operations. This was done by relaxing some unnecessarily close limits to eliminate machining operations such as milling.

"One important item that must not be overlooked is the complete coordination of quality control programs between vendor and customer."

In all, six parts are made as zinc die castings. Four of these are shown in figure 2. The body casting is of particular interest. Examination of figure 3 shows a rectangular opening between two cored holes. This opening (marked A) has sharp edges and is made by interlocking die halves. There is no way, other than by die casting, which would give this opening without a lot of secondary machining.

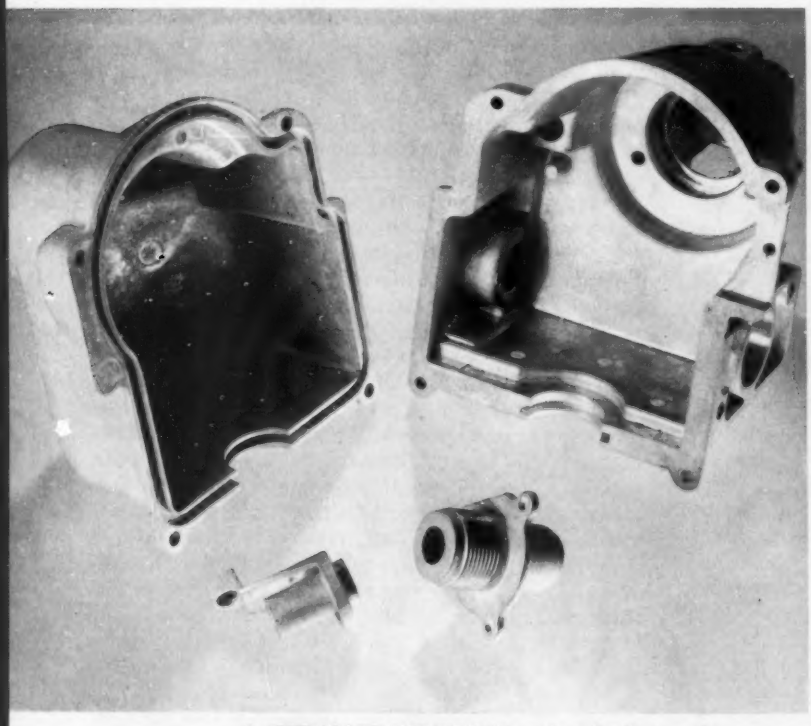
What is the Speedostat? It's an automotive speed control device, made by the Perfect Circle Corp., of Hagerstown, Ind. But, unlike a governor, it does not simply limit the top speed of the car. The driver can preset the road speed and the Speedostat will then maintain that speed. For passing, gentle pressure on the accelerator over-rides the control. When pressure is released the vehicle returns to the preset speed. Of greater importance is that the slightest pressure on the brake restores the car to full manual control.

In the initial stages of the casting development work, both aluminum and zinc alloys were given consideration by the manufacturer. According to Perfect Circle engineers, the governing factors in the final selection of zinc over aluminum were decisive.

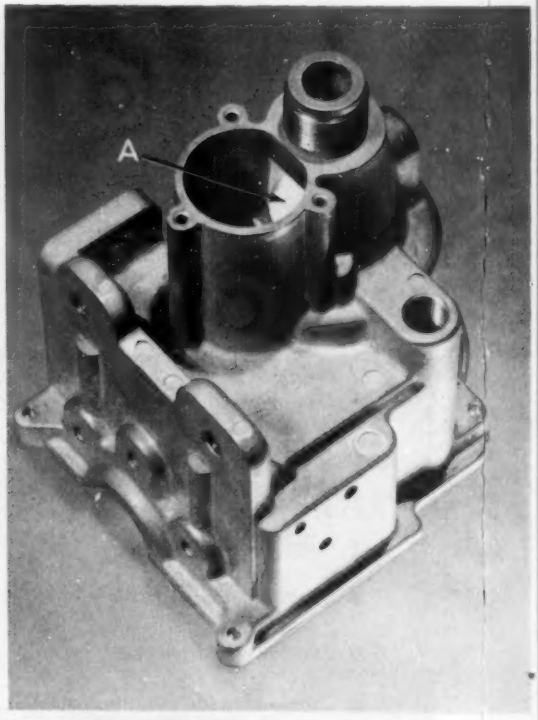
The intricate design of sections in several of the castings, principally the housing and cover, dictated the use of zinc alloys. The ability to be die cast in thin sections and still provide the desired strength was satisfied by zinc. Other advantages include economical and maintenance of close dimensional tolerances—frequently achieved as-cast with zinc. In conjunction with close tolerances, ease of machinability is another important zinc advantage. In a number of instances, the design called for virtually zero draft on cored sections, effectively handled with zinc.

Surface smoothness is another advantage of die castings for this unit. For example, the body and cover are cast with a groove to accommodate an "O" ring gasket. These mating surfaces are used as-cast.

Finally as Perfect Circle engineers point out, there is considerably greater tool life of the die casting dies when used with zinc, plus higher speed of production characteristics of the zinc die casting process. These result in lower cost per casting.

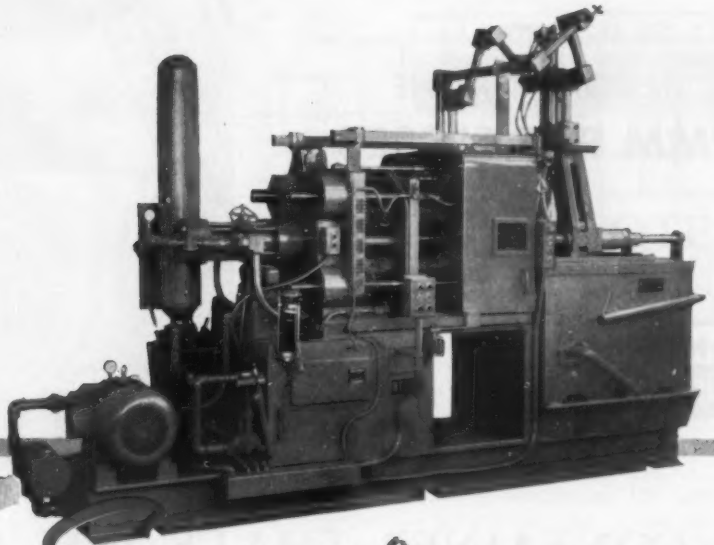


2. INTRICATE DIE DESIGN and coring feature these zinc alloy die castings. Only drilling and tapping have to be done.



3. THIS BODY CASTING shows what can be done with good die design to get as-cast results not possible in any other manner.

GREENLEE-B&T
AUTOMATIC ZINC OR ALUMINUM DIE CASTING MACHINES



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DESIGN FOR THE PMM PROCESSES

DESIGN FOR EXTRUSIONS

THE CONTAINER THAT'S NOT A PAPER BAG

OVERSEAS SHIPMENT of heavy industrial equipment requires a container much stronger than a paper bag.

Grace Lines went a jump further. It wanted a container that was strong and that would reduce handling of cargo. It now uses the Grace Line Seatainer Service container manufactured by Highway Trailer Co. The container is lightweight and strong because it's made with four extrusions manufactured by Michael Flynn Manufacturing Co.

Each container is 17 feet long, 8 feet wide, and 8 feet high. Each has a capacity of 18 long tons and can be stacked five high in specially constructed ship's holds. On land, two of these containers fit on a 35-foot flatbed trailer.

Two major design problems had to be worked out. Cap rail stress, of 6,950 psi when the loaded container is lifted by crane from truck to ship, had to be worked out, also containers had to maintain alignment even after long voyages where the cargo may shift as the ship rolls up to 30 degrees.

To gain maximum strength at minimum weight, designers specified aluminum extrusions wherever possible. Four shapes are used for—body stakes, cap rail, roof bow, and 4-inch cross sill. High tensile steel is used for rub rail, top rail and front stakes. The well-designed combination is strong enough to take loading stresses, and strain from an ocean voyage.

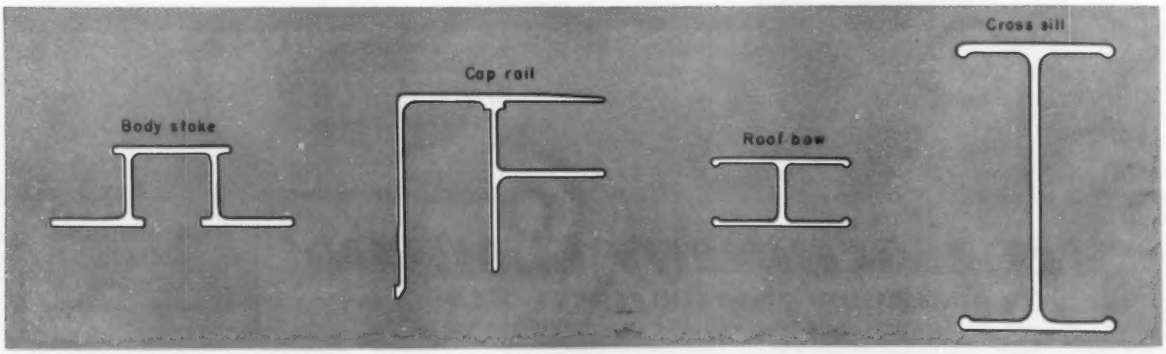
Cross-sectional view of the extrusions shows that thin walls were used to cut off all unnecessary weight. Yet each shape is designed to add strength to the completed container assembly. One-piece extrusions eliminate chance of a break if two or more parts would be welded together. Surface of the extrusions are smooth requiring no finishing after installation. All that is required is cutting to length. The aluminum resists corrosion on land and at sea.

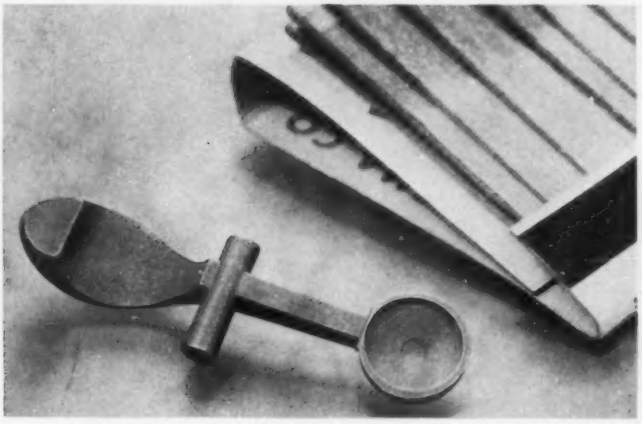
Final tests proved the containers' good design.

In one test the container showed no damage after 241,530 pounds of sheet and plate steel were stacked on it. This simulated the weight of six loaded containers on top of each other.

To simulate effects of a ships roll, in another test 40,000 pounds were loaded in the container and 8,000 pounds on top, and the container was rocked.

Other successful tests involved lifting, holding strength of the roof and tests to prove that the container is waterproof.





DESIGN FOR
INVESTMENT CASTINGS

A KEY NOTE IN REDUCING COSTS

FROM 5 STAMPED PARTS to one well-formed investment cast clarinet key—saved considerable manufacturing costs for one company.

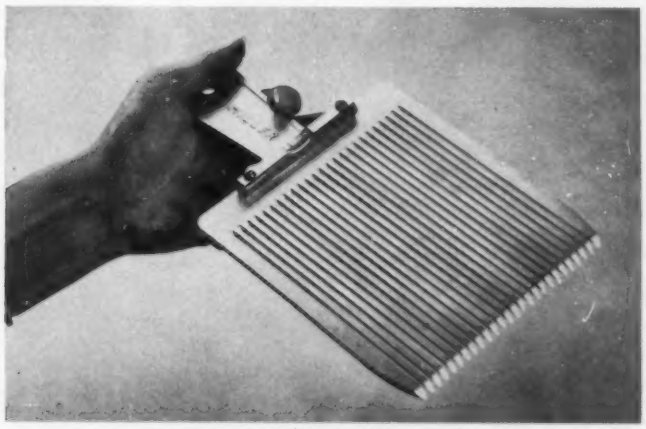
The part is small as a match folder but when thought of in production quantities, it proves to be an excellent example of what can be accomplished in bringing a better product to the consumer through one of the PMM processes.

The manufacturer originally bought five parts that were either stamped or forged, and then paid excessively to have them assembled.

By going to Casting Engineers, Inc. and having the complete key investment cast as one part, manufacturing costs were cut terrifically. But this is not where the bonus features stop.

The investment cast part is made of nickel-silver and more ductile than the original key. This is of great interest to the company for often slight adjustments must be made once the clarinet is assembled.

Also the investment cast part has smooth surfaces which only require buffing to give each casting a high gloss finish.



DIE CASTING HELPS FLAT-TOPS

FOR MANY YEARS BARBERS have been troubled with keeping Junior's flat-top haircut, flat. Sound familiar?

An ex-barber, Mr. John Miller, found a solution. Until recently he machined the odd looking comb in his basement workshop. Demands grew and he had to find a way to mass produce.

One suggestion was to make the comb from plastic.

The suggestion was discarded. Plastic would not provide the rigidity necessary for the long teeth, nor would it be durable.

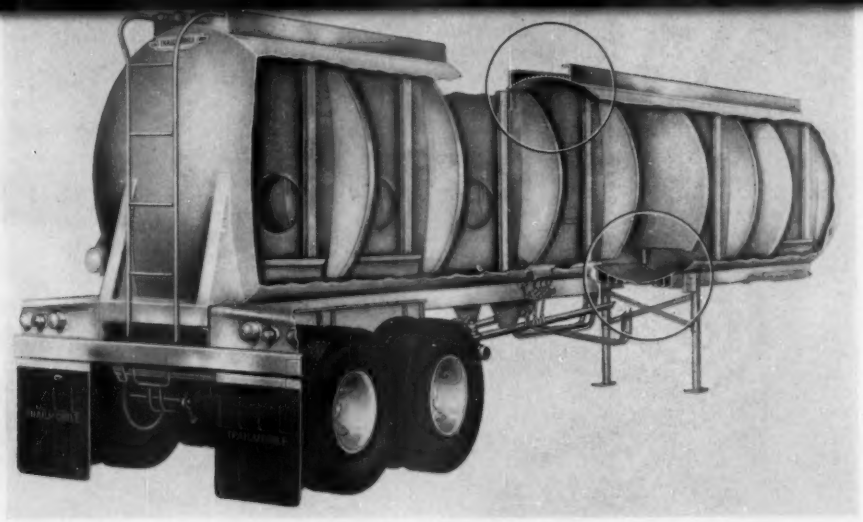
He then approached a custom die caster who suggested he manufacture the comb of aluminum.

Aluminum provided rigidity, also added to its appearance and is light in weight. It would be unquestionably more durable than plastic.

By die casting the part, little finishing is required. Each tooth is smooth enough to glide over the scalp. Only machining required is to thread two cored holes used for fastening the handle. Other labor necessary, scratch-brush the casting and tighten two screws.

In case you didn't notice, there is a level in the handle which keeps the comb even as clippers operate over the comb.

DESIGN FOR EXTRUSIONS



20% STRONGER TANK TRAILERS

EXTRUDED ALUMINUM SHAPES are used to strengthen the new line of Trailmobile, Inc. tank trailers that will soon appear on U.S. highways.

By using Kaiser aluminum extruded shapes, fabrication costs are cut, weight is decreased, assembly time lessened, total structure is approximately 20% stronger, easier flow of liquid through the compartments and there is less of a cleaning problem. The final assembled trailer under full load has already been road tested. No spot failures, no sign of stress on the tank after 50,000 continuous miles.

The new design concept, as shown in the photograph, is most easily seen by the cut-a-way section. Two major extruded pieces are: the top walkway; and the lower curved section with strengthening members.

The upper walkway has a corrugated surface extruded as part of the shape to provide better footing. The flashing adds eye appeal and strength.

The bottom extrusion has 6 integral tension members to provide reinforcement against stress. Barely visible is a 3/16-inch by 3-inch trough which provides improved drainage through an uninterrupted channel. On conventionally fabricated tank trailers, pools develop because of crosswise welded joints.

Improved strength of the tank is attributed to elimination of cross welding required in conventionally constructed trailers where individual sections are combined.

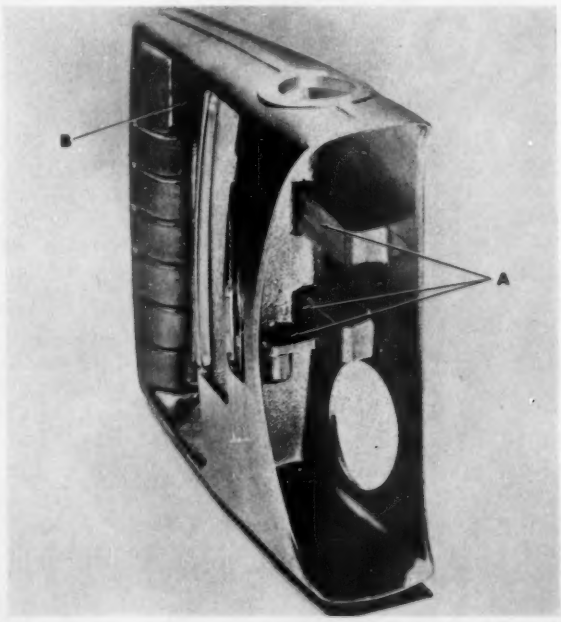
THE BEST WAY IS PERMANENT MOLD

THE FIRE EXTINGUISHER HANDLE is permanent mold cast for two good reasons. And since Monarch Aluminum Mfg. Co. engineers went to work designing for permanent mold, additional advantages have been realized.

One requirement of the buyer is the clean looking finish you see on the handle in the photograph.

Also important is the hollow aperture required in the handle of the trigger housing, see arrow B. This is accomplished by using a sand core with the permanent mold.

To originally make the mold, engineers had to first



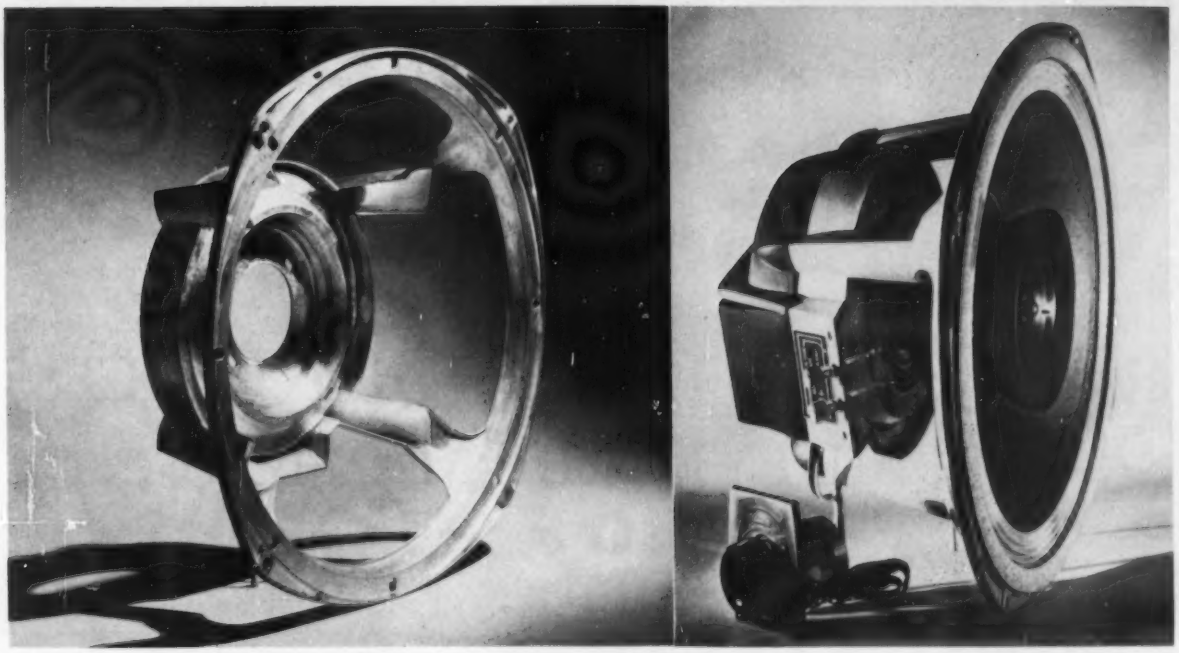
sand cast the handle. It gave them an opportunity to level off the surfaces at arrow A. By getting rid of excess metals before casting, considerable end product machining expense was eliminated.

Engineers purposefully designed a wide edge the entire length of the handle. This is the mold parting line. In production it is easy to remove rough edges without marring the finish.

When the refinements were made on the sand cast handle, a permanent mold was produced.

Success of the extinguisher handle was noted when the buyer found the curved portion contoured his extinguisher most satisfactorily without requiring secondary machining.

DESIGN FOR
DIE CASTINGS



DESIGN AFFECTS THE EAR

WHAT THE HEADLINE TELLS is that good design of this speaker basket is significant in producing better resonance. If your ear could pick up a wide range of sounds it would hear from full base of 30 cps to high frequencies of 22,000 cps with smooth and flat response.

The high-fidelity speaker basket is a new design method. By die casting it from zinc, the University Loudspeakers, Inc. is able to produce a finished diffaxial 3-way speaker assembly at a lower cost. It gives the end-user customer greater satisfaction. The same design is used for 12 inch and 8 inch speakers.

Formerly the part was made of steel stampings which required expensive machining including spinning, several assembly operations, and final inspection for size.

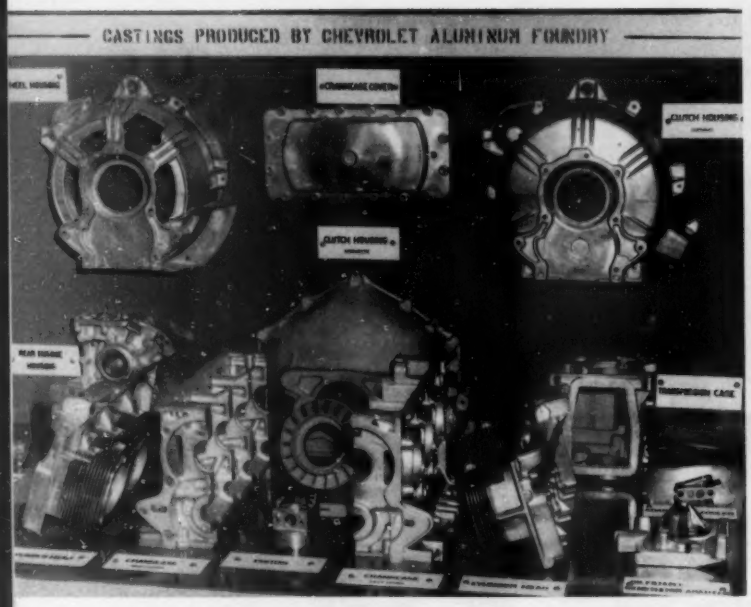
Now die cast, support flanges, slots, ribs, studs, and channeling are all one piece. There is no problem with centering the outer rim and mounting cone, magnetic pot assembly and other components.

Metal properties plus the basket shape effect a low resonant quality and a dumping effect plus a control reverberation that adds materially to the acoustic qualities of the speaker. Unwanted peaks in sounds produced are greatly reduced.

The hollow struts designed for the basket have better resonance quality. They have minimum sound reflecting surfaces. Also the V design adds strength.

Zinc is non-magnetic. Therefore there is no loss of magnetic energy in the finished speaker assembly.

One zinc supplier, the New Jersey Zinc Company, summed it all up by saying: "the speaker is an ingenious combination of novel construction and the very latest mechanical and acoustical efficiency."



AN ALUMINUM ENGINE uses these castings (left). All are made at Massena. Above a crankcase casting is removed from the low pressure casting machine.

CASTING BY THE SCHMIDT PROCESS AT CHEVROLET-MASSENA

A NEW CASTING PROCESS is in operation at the Chevrolet engine plant near Massena, New York. Developed in Germany by Carl Schmidt, the new process is midway between die casting and permanent mold casting.

A segmented metal mold opens to allow free access to all interior parts where cores (sand, plaster, or shell) have to be placed. Air cylinders mounted on a rigid framework actuate all of the mold segments. The mold assembly is positioned above a pot cover. With the mold closed, air pressure on the surface of the molten metal forces aluminum through a feed tube into the mold.

Air vents in the mold allow the air to exhaust ahead of the metal so that there is no air trapped in the casting. The pressure on the pot of metal is only 10 lb. gauge so the rate of metal flow is not fast. When the mold is completely filled and while solidification goes on, pressure is held on the pot to feed molten aluminum to all shrink cavities.

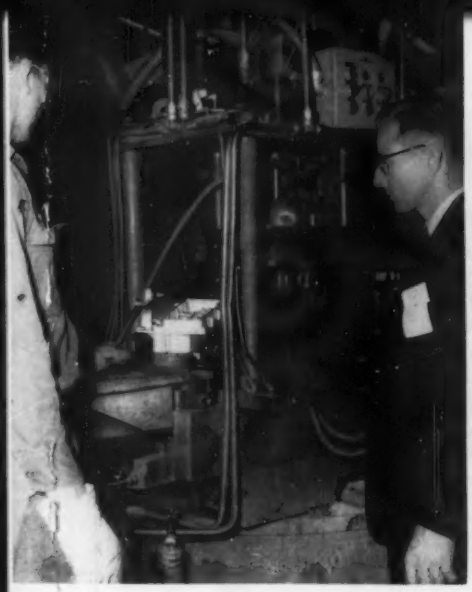
A casting cycle is relatively long, from 3 to 3½ minutes. The metal temperature varies from 1180°F to 1400°F, depending on the casting.

The machine operates on automatic cycles so that one operator can take care of at least three machines. With this arrangement, the casting rate per man-hour compares favorably with die casting. Since the cylinder head casting weighs 20 lbs., die casting would not be faster than one shot per minute. Thus the Schmidt process is about as fast in production per man-hour and has the advantage of allowing the use of non-metallic cores.

The casting machines, without the furnace, cost a tenth as much as a die casting machine capable of making the same size piece. The holding pots are the same for both processes.

The castings made at Massena by this low pressure method probably cost less, overall, than by die casting or permanent mold casting.

Another advantage of this process is the much lower scrap from trimming. On the 20 lb. cylinder head, for example, the total trim scrap is less than 2%. What's more, rejects due to faulty casting are very low. With gravity permanent mold casting the average reject rate for comparable castings will run from 5% to 8%. On die casting the reject rate runs from 3% to 5%. In the Schmidt process, scrap castings come to only 0.5% to 2%.



A CYLINDER HEAD is made on this low pressure casting machine. The method of casting insures freedom from porosity, good reproduction of detail.

ANOTHER VIEW of the cylinder head casting machine. The mold is clamped to the top of the melting furnace with an air tight joint. Induction heating is used.

These two factors—low trim scrap and low rejects—help to cut casting costs so that the over-all cost of trimmed castings ready for machining is lower than by any other method. The cost probably is lower than green sand casting, if the parts could be made by that process. Certainly, if sand castings were used the subsequent machining would be much higher.

How about tolerances? They're close enough on this engine so that later machining is reduced to the simplest operations. All of the larger holes are cored, but it's cheaper to drill small holes than it is to core them.

Some of the engine parts are die cast. Chevrolet has a number of die casting machines in the foundry. The crankcase cover, clutch housing and a number of small components are die cast.

Pistons are permanent mold cast on conventional machines for piston casting.

Metal for the Chevrolet foundry comes from the Reynolds Metals Co. reduction plant less than one mile away.

The molten metal is completely alloyed by Reynolds except for magnesium. Magnesium burns out rapidly so it is added in the alloying and holding furnaces at the foundry.

The transport ladles hold 7000 pounds of molten aluminum and are delivered two at a time on a demand schedule. At the foundry the metal is poured into 30,000 lb. holding furnaces where final alloy additions are made. From the holding furnace, the molten aluminum is distributed to the individual casting pots by a special fork truck with a ladle carrying and tilting device.

Currently, Chevrolet is taking about 20% of the Reynolds' output, but the reduction plant is operating at only 2/3 of capacity. All of the metal not sent to the motor foundry is cast into pigs, ingots, and extrusion billets for shipment to other Reynolds Metals Co. facilities.

THE REAR ENGINE HOUSING is another casting made on the low pressure casting machine. Here again, good detail and freedom from porosity are essential.

A DIE RELEASE AGENT is sprayed on the mold after each casting (left). Primary inspection of the casting is at the machine (right).

DESIGN FOR
INVESTMENT CASTINGS

DESIGN FOR SOUND CASTINGS

Sound castings are a function of design. When you find porosity, sinks, pipe, or cracks at either internal or external corners the fault is generally one of design. Some times, these troubles are due to faulty foundry practice, but these cases are very rare.

There are just a few design errors which lead to most unsoundness in castings. In most cases they can be avoided if the designer knows something about metal solidification. When there's any doubt, consult a competent foundryman during design.

THIN AND THICK SECTIONS (figure 1)

Always try to keep metal sections fairly uniform. A thin section freezes faster than a quick one. As the molten metal cools and solidifies it shrinks and draws molten metal from the adjacent heavy section. The result is a shortage of metal in the heavy part and porosity. This can be overcome by gating so that there is a supply of molten metal to feed all parts as they cool. Much better, however, is to make all sections about the same thickness if possible. One way is by coring, another make the heavy section tapered.

Figure 1a shows how porosity develops when no precautions are taken. Two possible solutions are shown in figures 1b and 1c.

SHARP CORNERS (figure 2)

Always allow the most generous radius or fillet possible. When sharp corners are cast there is a marked tendency for cracking due to the high shrinkage stresses set up when the metal cools. Where there is a sharp change in direction the stresses are highly concentrated and the relatively weak, hot metal will crack.

Figure 2a shows how cracks form at sharp corners. The generous radii and fillets shown in figure 2b will minimize or eliminate these cracks. If the design requires sharp corners, consider machining after casting. When essential, quite sharp corners can be investment cast, but scrap losses may be high.

PROPER GATING

Always remember that metal has to be poured into a mold. It has to feed continuously to all sections as the casting cools and solidifies. Finally the gate should never be located on a finished surface if it's possible to avoid this. How a casting is best gated can be argued, but there are a lot of areas of general agreement. Generally it is best to consult a casting vendor during design so that the foundry will later work under the best possible conditions.

BOSSES (figure 3)

Even when properly designed, there will be a tendency for sinks to form either on or below heavy bosses.

FIG. 1

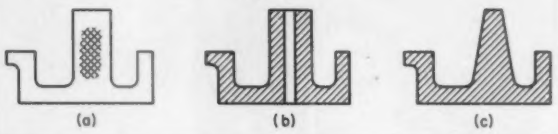


FIG. 2

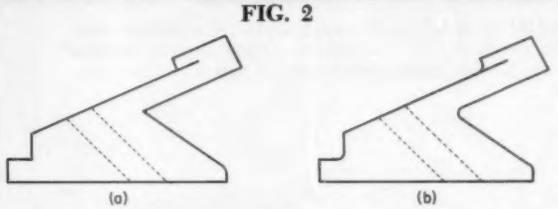
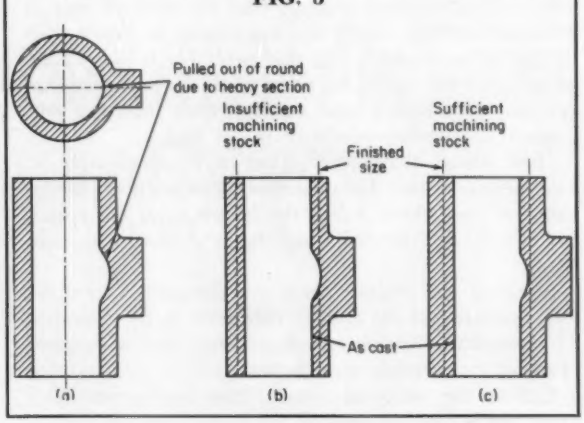


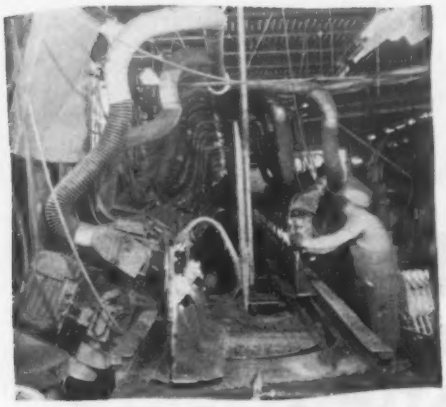
FIG. 3



Whenever possible allow machining stock to remove the sink. Figure 3a shows how a boss can pull a hole out of round by a sink formed opposite a boss. Be sure to allow plenty of machining stock to clean-up out of roundness or sinks as shown in figure 3c. Sinks on the boss surface may be permitted in some designs, but it's best to avoid them.

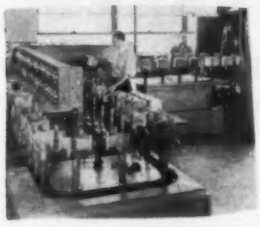
The points noted above are not, of course, the only reasons for unsoundness in castings. However, if care is taken during design to make sure that all of the above cautions are observed, a higher percentage of sound castings will result.

Editor's note: The material for this article came from "How To Design and Buy Investment Castings" a publication of the Investment Casting Institute. Copies of this book can be purchased from the Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill., for $3.95 per copy.



AUTOMATIC BUFFING

TRIMMING



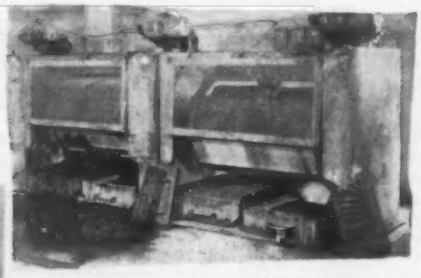
AUTOMATIC PAINTING

The specialized finishing metals, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here.

PMM

FINISHING SECTION

ELECTROPLATING MAGNESIUM PAGE 45



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SPRAY PAINTING

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VERY ECONOMICAL—Works well over wide variations of temperatures and concentrations.

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VERSATILE—Use in cyanide solutions with or without tartrates, Rochelle salts or proprietary substitutes.

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BASIC PREPLATING TREATMENT FOR MAGNESIUM

1 SURFACE CONDITIONING

2 ACTIVATING

3 ZINC IMMERSION COATING

4 COPPER STRIKE

ELECTROPLATING MAGNESIUM

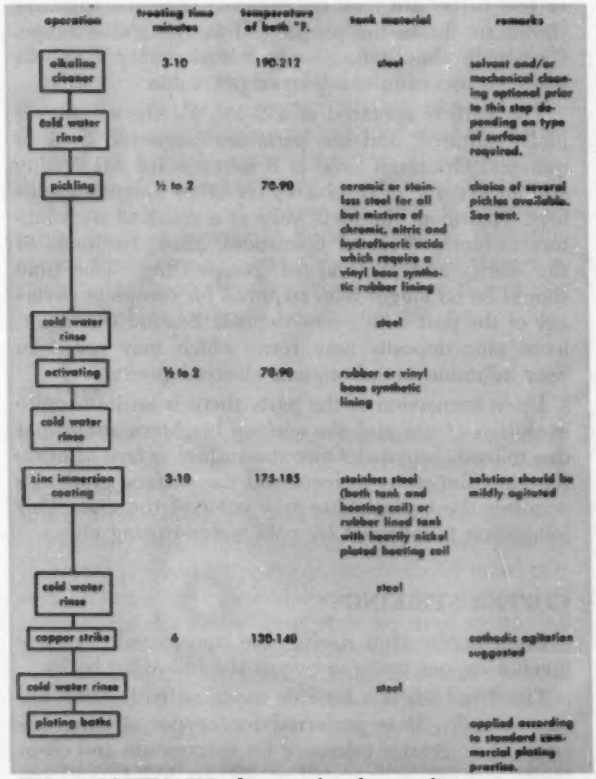

FIG. 1 SCHEMATIC diagram for the preplating treatment of wrought and cast magnesium and magnesium alloys.

MAGNESIUM CASTINGS, both pressure die and permanent mold can be successfully electroplated. Development of satisfactory methods has opened new fields for magnesium castings where a bright tarnish resistant surface is needed or where wear resistance is required.

In general, the process requires an initial immersion zinc coating followed by a copper strike. After these initial steps, standard electroplating procedures can be followed. With this preliminary treatment, any metal which can be plated onto a copper surface can be applied. The entire success of the process depends upon the adhesion and uniformity of the zinc immersion coating. Properly applied it is a tightly adherent layer of pure zinc about 0.0001″ thick.

The adhesion of the electrodeposits is good. Wrought and extruded products have withstood heating to the melting point of the magnesium alloy (generally 1100° to 1200°F.) without lifting or blistering of the deposits. Plated castings can be processed to withstand heating up to 550°F.

Both copper and silver plated surfaces can be joined by soft soldering without disrupting the adhesion. The metal can be bent and hammered without surface breaks and heavy chromium deposits, put on for wear resistance, show no tendency to peel.

Service conditions determine the plating cycle to be used, but in general corrosion tests such as salt spray, high humidity, and exposure indicate satisfactory performance for the type of plate applied.

Figure 1 is a general flow chart for electroplating

both extruded and cast magnesium. The basic steps involved are:

1. Surface Conditioning
2. Activating
3. Zinc Immersion Coating
4. Copper Striking
5. Standard Plating Procedures

SURFACE CONDITIONING FOR PLATING

All metals to be plated require careful surface preparation for good electroplating. Surface preparation of magnesium varies with the form (whether cast or wrought), the condition of the part when received, and the type of surface desired. All parts must be either pickled or mechanically polished. If pickling is used, cleaning must be employed as a prior step to remove any oily matter. Shot blasting (using round steel shot 1/8" diameter or less) may be used to improve plateability on porous castings.

MECHANICAL OPERATIONS

If a smooth highly polished surface is desirable, the parts are wheel polished and buffed. Small parts may be tumbled and burnished. Blasting can be used but must be followed by a pickling step to remove at least 0.00025" of surface before any plating steps are attempted. This same pickling step must also be carried out where steel wool or wire brushing has been used for cleaning surfaces. After mechanical polishing operations, parts should be cleaned to remove buffing compounds or oily matter.

CLEANING

Where grease, buffing compounds, and similar oily matter is present on magnesium parts, solvent rinsing, vapor degreasing, solvent emulsion cleaning, or alkaline cleaning may be used.

PICKLING

Magnesium parts not mechanically finished should be thoroughly cleaned in solvent and/or alkaline cleaner and then acid pickled. Cast parts are given the Chromic-Nitric-HF bath or the phosphoric acid pickling bath. For wrought magnesium chromic acid-nitrate pickle or acetic nitrate pickling are suggested.

In cases where dimensional change or even minor loss of detail cannot be tolerated as in the case of photo-engraved printing plates, chromic acid pickling must be used. It should be pointed out that chromate pickles are not suitable on thorium containing alloys because they prevent proper formation of the zinc coating. The phosphoric acid pickle should be used.

ACTIVATING

The following method of activating magnesium surfaces to receive the zinc coating is used.

Parts are immersed 30 seconds to 2 minutes at 70 to 90°F. in a bath of the following composition:

Conc. Phosphoric Acid (85% H_3PO_4)	1.6 pints
Sodium, potassium, or ammonium acid fluoride ($NaHF_2$, KHF_2 or NH_4HF_2)	13 1/3 oz.
Water	to make 1 gallon

This solution removes average surface contamination on magnesium without a roughening etch, as well as activating it to receive the zinc immersion coating.

Activating is followed by cold water rinsing.

ZINC IMMERSION COATING

The following solution is used for applying the zinc immersion coating to the standard magnesium alloys:

Zinc Sulphate Monohydrate ($ZnSO_4$-H_2O)	4 oz.
Tetrasodium pyrophosphate ($Na_4P_2O_7$)	16 oz.
Potassium Fluoride (KF)	0.94 oz.
or	
Sodium Fluoride (NaF)	0.67 oz.
Potassium or Sodium Carbonate (K_2CO_3 or Na_2Co_3)	0.67 oz.
Water	to make 1 gallon

The bath is prepared by first dissolving the zinc sulphate monohydrate in water at room temperature. The solution is heated to 140-180°F. and the tetrasodium pyrophosphate added. A fluffy precipitate forms which dissolves after further stirring for 5-10 minutes or longer, depending on the temperature and degree of agitation. After the precipitate is completely dissolved, the fluoride is added, then the carbonate to adjust the pH, which may range between 10.0 and 10.6 with a 10.2-10.4 level preferred. More or less carbonate may be required than the quantity shown to obtain the proper pH in the above range. Carbonate should be slowly added and pH checks made to ascertain the proper pH value.

The bath is operated at 175-185°F.; the solution is midly agitated, and the parts are immersed 3 to 10 minutes. Optimum time is 3 minutes for MIA alloy and an average of 5 minutes for other magnesium alloys. Treatment time will vary as a result of such factors as temperature of operations, alloy, freshness of the bath, and method of pre-pickling. The time should be no longer than required for complete coverage of the part with a zinc deposit. Beyond this point, loose zinc deposits may form which may result in poor adhesion of subsequent electrodeposits.

Upon immersion of the parts there is an immediate evolution of gas and the surface brightens somewhat due to oxide removal. Once the surface is free of oxide the zinc film starts to form and the surface gradually acquires the typical blue-gray color of the zinc. This immersion is followed by cold water rinsing only.

COPPER STRIKING

Immediately after rinsing, the zinc coated parts are given a copper strike in one of the following baths.

The first bath is a fluoride modified bath using potassium salts. It is preferred for copper striking because of its greater tolerance for magnesium and chromium ions. It is operated at 130 to 140°F. and cathodic agitation is suggested. Bath composition is;

Copper Cyanide (CuCN)	5.5 oz.
Potassium Cyanide (KCN)	9.0 oz.
Potassium Fluoride (KF)	4.0 oz.
Free Cyanide	1.0 oz.
Water	to make 1 gallon

The bath's pH range is 9.6 to 10.4 (colorimetric).

A Rochelle salt plating bath for copper striking may also be used. It has no advantage over the previous bath but may have wider use where a variety of metals is being plated. The bath is operated at 130 to 140°F. with cathodic agitation preferred. The bath composition is as follows:

Copper Cyanide (CuCN)	5.5 oz.
Sodium Cyanide (NaCN)	6.8 oz.
Sodium Carbonate (Na_2CO_3)	4.0 oz.
Rochelle Salt ($KNaC_4H_4O_6$-$4H_2O$)	6.0 oz.
Free Cyanide	0.75 oz.
Water	to make 1 gallon

The pH is 9.6 to 10.4 (colorimetric).

When using either bath electric contact is made quickly. The initial current density should be 5 to 10 ASF, in order to prevent blistering particularly on high current density areas. The limiting factor is that no gassing shall occur. This current density can be continued during the complete striking period or can be increased after 2 minutes to higher current densities of 20 ASF or more. The maximum current density that can be used after the initial 2 minute period is somewhat flexible, depending upon the shape of the part and the bath operating conditions. In any case, it should not be higher than that density which will produce smooth deposits and prevent burning.

Periodic current reversal has been found advantageous with the copper striking bath. Using a 15 second forward and 3 second reverse plating cycle bright smooth deposits may be obtained, thus eliminating the need for a further copper plating step for maximum brightness. In using periodic reversal on copper striking, it is best to plate the first 30 seconds to 1 minute on the forward cycle and then apply the alternated forward and reverse cycle. This allows an initial layer of copper to build up before deplating occurs thus assuring good adhesion of the copper to the zinc immersion coating. The minimum time in the copper striking bath will be about 6 minutes.

PLATING

After the copper strike, any standard plating methods may be used. Some of the more common electroplates applied are: copper, nickel cadmium, zinc, brass, silver, chromium, and precious metals.

The only case where more than usual care must be exercised is when stripping is required. All usual procedures may be followed except in the removal of copper. Here, extreme care must be used to prevent etching the surface of the magnesium. A hot alkaline polysulphide dip followed by a dip in cyanide is commonly used. This is one of the standard methods for removing copper from other basis metals.

Material for this report was furnished by the Dow Chemical Co., Midland, Mich.

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LURIUM CAN BE ANODIZED

Die castings of super purity aluminum have been successfully produced for the first time, by the Nelmor Manufacturing Corporation, Euclid, Ohio.

The process, which requires vacuum casting, is considered a major breakthrough in the fabricating of super purity aluminum. It was developed by David Morgenstern, president of Nelmor. Working closely with him, was Howard Fromson, president of Fromson Orban Company, Inc., New York, who introduced the first super purity aluminum to the United States in 1953.

Lurium alloys, which are 99.99% pure aluminum, were used throughout the experimental and development processes to achieve a brilliant, homogeneous high finish casting. The anodized results achieved are said to produce the brightest finish ever obtained in a die casting.

The new process opens up many fields of application for super purity aluminum not heretofore possible because of the limitations of fabricating techniques for wrought alloys. Anodized aluminum die castings with a permanently lustrous high finish, whose reflectivity exceeds that of chromium, are now a reality. After anodizing, the castings can be dyed to simulate the most brilliant gold, silver, platinum or brass, as well as any color in the rainbow.

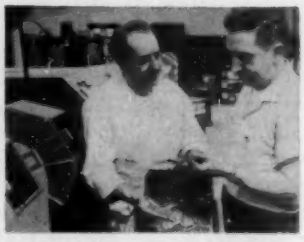
Because of their corrosion resistant properties, the Lurium castings are expected to find many applications in the marine, plumbing and building hardware fields. And their attractive colors are said to be especially suited to appliance trim, giftware and jewelry. The high reflectivity points to many uses in the lighting field.

PARKER PEN MAKES A POINT:

the importance of proper finish . . .

and

how ABBOTT helps to get it



Throughout the world, a Parker Pen is quickly identified by its distinctive arrow clip. Even while clasping firmly to a coat or shirt pocket, the clip properly signals the prominent Parker name . . . in some Asian countries, it's a status symbol and a mark of the wearer's literacy!

For these and similar reasons, the clip must **always** retain a gleaming, jewel-like finish . . . a finish durable enough to withstand the roughest everyday abuse . . . a finish that has no microscopic rough edges to snag or fray pockets.

To give the clip just such a finish, Parker uses Abbott steel burnishing media in vital tumbling operations. Besides producing the lasting, polished finish, the high-quality Abbott shapes increase the clip's surface hardness by compressing and compacting the grain structure of the metal.

What's right for your product . . . **finish** or **cut?** Send us a product or part sample. Without charge, we'll test it thoroughly and return useful recommendations promptly.

REQUEST BULLETIN AP-1 AND SAMPLE SHAPES

THE ABBOTT BALL COMPANY
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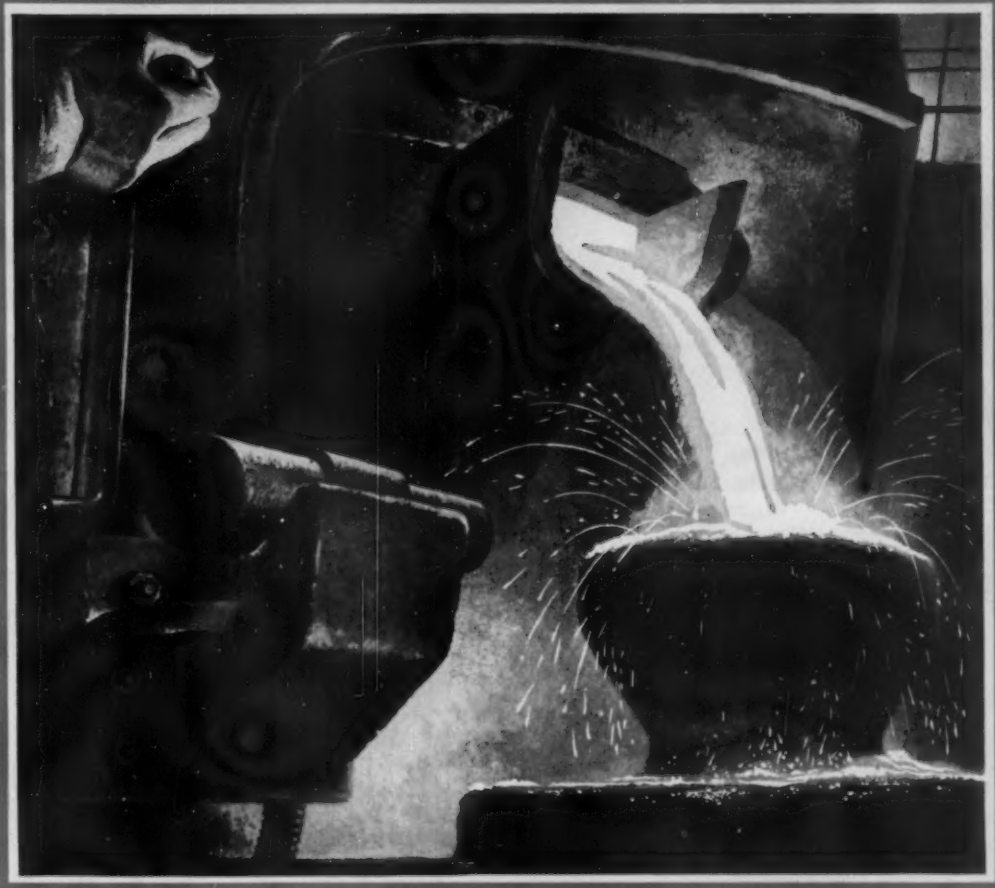
PRECISION METAL MOLDING



Melting furnace at Calumet & Hecla, Inc.—Wolverine Division, where Shell Irus Fluid 902 eliminates the danger of hydraulic line fires.

Ready... aim... NO FIRE!

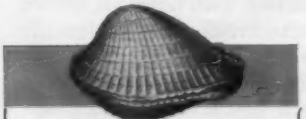
Take 10 high-temperature alloy-melting furnaces, hydraulically operated—each pouring 1500 lbs. of molten metal every hour in close proximity to "live" hydraulic lines—and you can readily see why selection of hydraulic fluids is important to Calumet & Hecla's Wolverine Tube Division.

Now the operation is made more reliable by the use of Shell Irus Fluid 902, a water-in-oil emulsion type fluid. Irus® Fluid was C & H's choice, after carefully studying other commercial hydraulic fluids—for many reasons:

1. Irus Fluid will not support combustion.
2. Irus Fluid has excellent lubricating properties.
3. Irus Fluid has hydraulic efficiency and equipment compatibility.
4. Irus Fluid is economical, costing about one-third less than other fire-resistant fluids.
5. Irus Fluid's bright yellow color makes it easy to spot and trace leaks.

In plant after plant, operators find that these advantages assure maximum safety to both personnel and equipment.

If you have a hydraulic line fire hazard, we suggest that you have the Shell Industrial Products Representative show you the many advantages in Irus Fluid 902; or write to Shell Oil Company, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif. In Canada: Shell Oil Company of Canada, Ltd., 505 University Ave., Toronto 2, Ontario.



AN INTERESTING FACT!
Every Shell Branded Industrial Lubricant is named for a sea shell. Shown here is the Irus elliptieus.

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

SHELL

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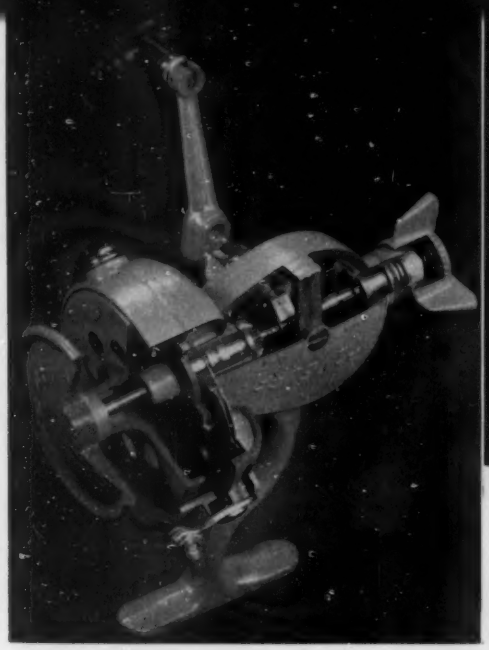
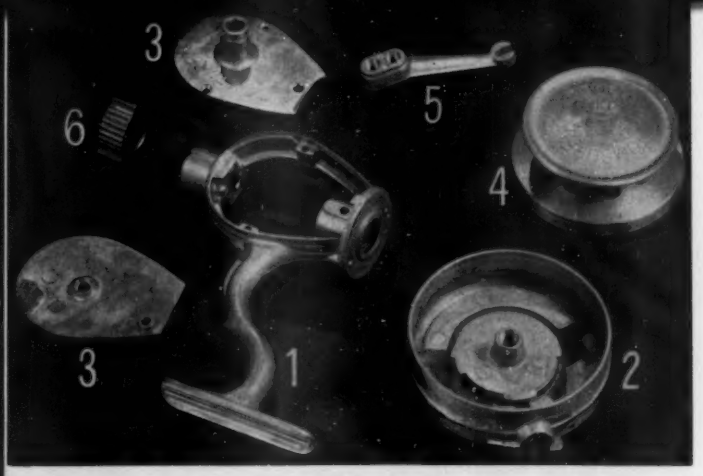




ALUMINUM DIE CASTINGS WITHSTAND SEA WATER

A GOOD SALT-WATER SPINNING REEL is a precision-made device, carefully constructed and embodying tough metal gears and pinions. So it's no surprise to find that Feurer Bros., White Plains, N.Y., is a leading maker of spinning reels.

A reel must be strong, not too expensive to make, and resistant to corrosion.

For these reasons, Feurer Bros. uses aluminum die castings for the structure of its Tomsurf spinning reel. Seven die castings are used: housing, with reel seat; top shell; spool; two side covers; crank; and drag cap wingnut.

The parts are cast with holes and bosses, and require little surface finishing or machining, except for removal of flash, and reaming, boring and tapping of holes. They are then dip-cleaned in benzine and air-dried before being anodized for corrosion resistance and painted with a hard, glossy epoxy enamel.

The resulting finish is extremely resistant to salt water corrosion and prevents galvanic action between the aluminum castings and the stainless steel, bronze and brass parts they touch. In lab tests, the painted castings have gone through 500 hours of standard salt spray, with no signs of corrosion.

The castings are made for Feurer by the Sherman Pressure Casting Corp.

Here are some machining details

1. HOUSING. The raw casting is cleaned by wire brushing and visually checked for cracks. Flash is filed and ground off. Various holes, already cast in or centered, are drilled and tapped. The main shaft bearing hole is reamed and the outside bearing face is square-turned, concentric with the hole. A fine thread is cut on the outside of the main shaft housing to take the drag cap. The part is then washed in benzine and is ready for suface treatment.

2. TOP SHELL. Burrs and flash are removed. Holes are drilled and tapped. Lever slots, cast as extremely thin sections, are pushed through and shaved. A flat for an oscillating cam is milled and squared with the main shaft bearing hole.

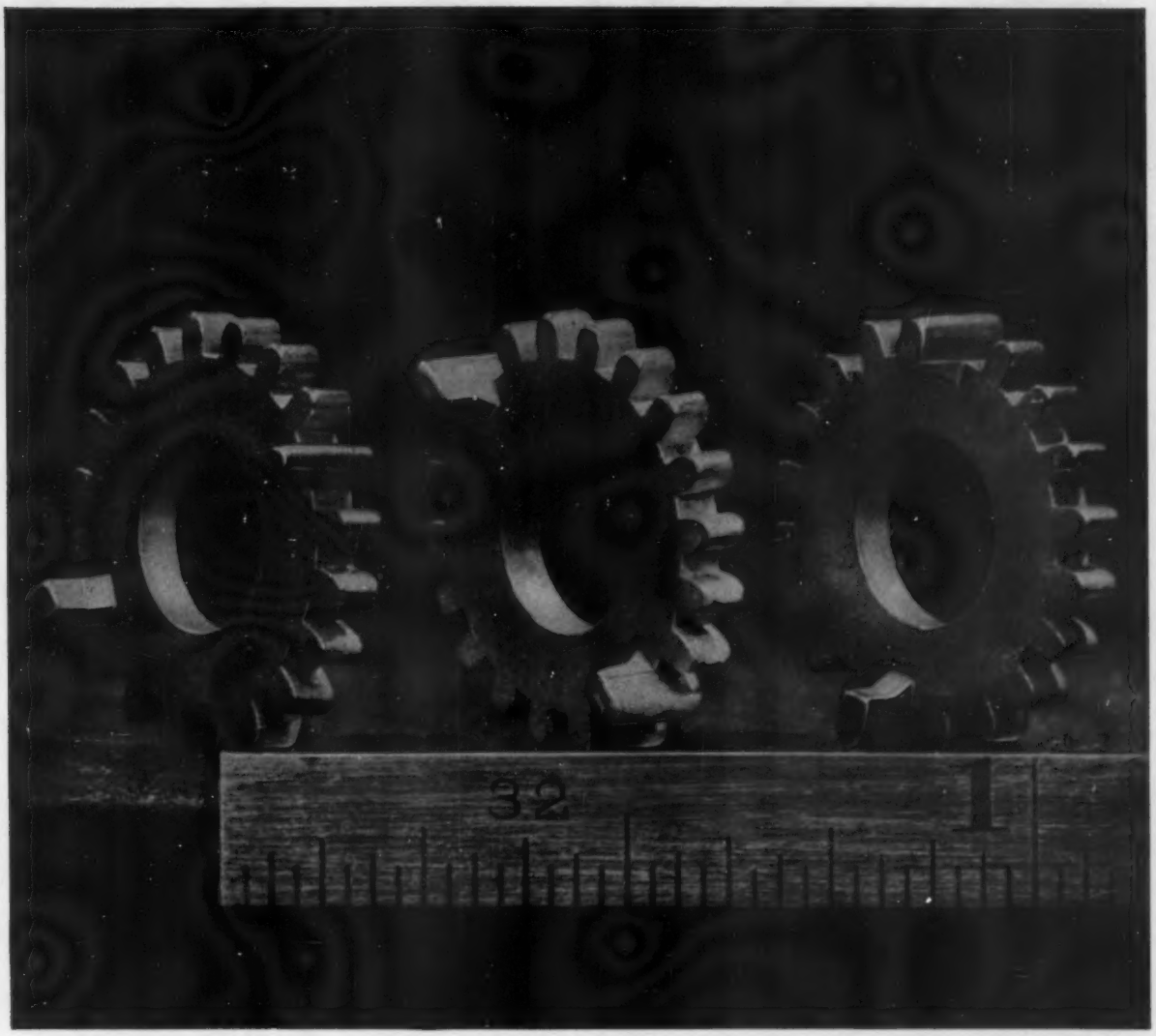
Originally, when parting line flash was removed, the edges of the exterior holes on the parting line diameter were being damaged. Simple fix was to redesign the piece with a ridge on the parting line, which is easily flattened without affecting the holes.

3. SIDE COVERS. Burrs are removed and cast holes shaved (flash removed) on the two side covers. One cover is cast with a brass insert bushing to take the crank shaft.

4. SPOOL. The outside diameter of the flanges is turned to size. Flash between the flanges is filed out. The hole for the main shaft is drilled and tapped. Flange radiuses are finished to size and concentricity.

5. CRANK. Flash is removed. Two holes are drilled as alternate locations for the crank shaft. Originally two different castings were to be made, one a long handle, the other a short handle. Now, a single long-handled piece is made, with two holes cast in place. Which hole is used depends on whether a long or short handle is wanted.

6. DRAG CAR WINGNUT. The inside is bored and threaded to fit on the matching part.



Baldwin press pins back ears of difficult powder metal part

The two tiny ears (lugs), continuation of the teeth on opposite sides of these tiny gears, make this a really difficult compacting job. Not only are the tolerances extremely tight for such a small part (plate thickness ±0.0015, center hole diameter ±0.001, total composite error only ±0.0015 in.), but the lugs must support a static load of 60 lb. during operation. Yet a Baldwin Press at the Supermet Division of Globe Industries, Inc., Dayton, Ohio, is turning out millions of these complicated adding machine parts at high speed.

Because of the extremely fine punches required for the lug compaction, a special protective accessory was designed to minimize punch breakage. Baldwin's patented dual-ejection mechanism made possible part expulsion without damaging the lugs.

Expanded facilities at our Industrial Equipment Division assure early delivery and continued high standards of manufacture in compacting presses that can do the job fast and economically. Write for information and specifications.

BALDWIN · LIMA · HAMILTON

Industrial Equipment Division · Philadelphia 42, Pa.

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USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications free by circling the numbers on the Reader Service Cards facing Page 56

PROCESSES

145 Die Castings — ADVANCE PRESSURE CASTINGS CORP. — Facilities brochure shows how a vendor with experience, modern equipment and a record of service will cut costs on your zinc and aluminum die casting requirements.

146 Investment Casting — ENGINEERED PRECISION CASTING CO. — 4-page brochure shows how the Shell-Kote process solves the problem of investment casting large parts.

147 Extrusions — UNITED STATES STEEL — 14-page technical bulletin shows how steel is hot extruded, lists the advantages and design requirements.

148 Investment Casting — MISCO PRECISION CASTING CO. — External house organ discusses the application of investment casting to make turbine blades for jet engines.

149 Plaster Mold Casting — MORRIS BEAN & CO. — 6-page brochure shows the facilities and services for making close tolerance castings by the plaster mold method.

150 Investment Casting — MERCAST DIV. OF ARWOOD CORP. — 6-page brochure discusses their facilities for making, intricately shaped investment castings which can carry high stresses and are heat and corrosion resistant.

MATERIALS & EQUIPMENT

159 Sand Lubricant — WITCO CHEMICAL CO. INC — Technical bulletin tells how a lubricant-release agent makes resin bonded sand mixtures free flowing, includes application data.

160 Bronze Alloy — RUBERY OWEN, CANADA LTD. — Technical data on a zinc-aluminum-copper alloy which has exceptional bearing and machining properties, and reduces prime costs.

162 Tool Steel — U.N. ALLOY STEEL CORP. — 6-page technical booklet lists the properties and heat treating instructions for Bohler MPD multiple-alloy hot work tool steel.

162 Sintered Carbides — SINTERCAST DIV. — 9-page technical report on the properties of vanadium, tantalum and niobium carbides sintered with carbon steel.

163 Continuous-Cast Bronze — AMERICAN SMELTING & REFINING CO. — 6-page brochure tells how to save by using continuous cast bearing bronze, includes engineering data.

164 Thermocouples — THE BRISTOL CO. — Bulletin gives specifications and engineering data on a line of metal-sheathed, ceramic insulated thermocouples.

165 Powdered Metals Lubricant — JOSEPH DIXON CRUCIBLE CO.—Data sheet describes a graphite lubricant which permits greater diversification of powdered metal parts.

166 Billet Furnace — GRANCO, INC. — 4-page folder lists the advantages of a gas-fired billet furnace which can reduce operation costs 70%.

167 Motor Controls — MINNEAPOLIS HONEYWELL REGULATOR CO. — 4-page bulletin describes a unit for the position-proportioning control of electric motors and other actuators.

168 Gas Heating Grid — GRANCO, INC. — 6-page brochure describes a flameless, incandescent gas burner designed to generate great amounts of radiant heat.

169 Fluxes — FOUNDRY SERVICES, INC. — 4-page selection guide describes the Coveral line of coverings and protective fluxes for aluminum alloys.

170 Furnace Equipment — ROLOCK INC. — 8-page catalog describes muffles and hearths for horizontal-type furnaces, tells how to get more profitable furnace operation.

171 Low Temperature Units — CINCINNATI SUB ZERO PRODUCTS—Literature describes a complete line of low temperature chambers for production chilling and environmental testing.

172 Aluminum Alloys — ALUMINUM CO. OF AMERICA — 12-page booklet lists engineering data and delivery information for aluminum alloys.

173 Nitrogen Generator — ENGELHARD INDUSTRIES, INC. — Booklet describes a unit for generating nitrogen with controlled amounts of hydrogen, includes price lists and data on operating costs.

174 Die-Set Bushings — THOMSON INDUSTRIES, INC. — Bulletin describes die set ball bushings which reduce friction and are interchangeable with sleeve-type bushings.

175 Die Casting Machines and Compacting Presses — HYDRAULIC PRESS MFG. CO. — 16-page bulletin describes the entire H-P-M line of die casting machines and powdered metal compacting presses.

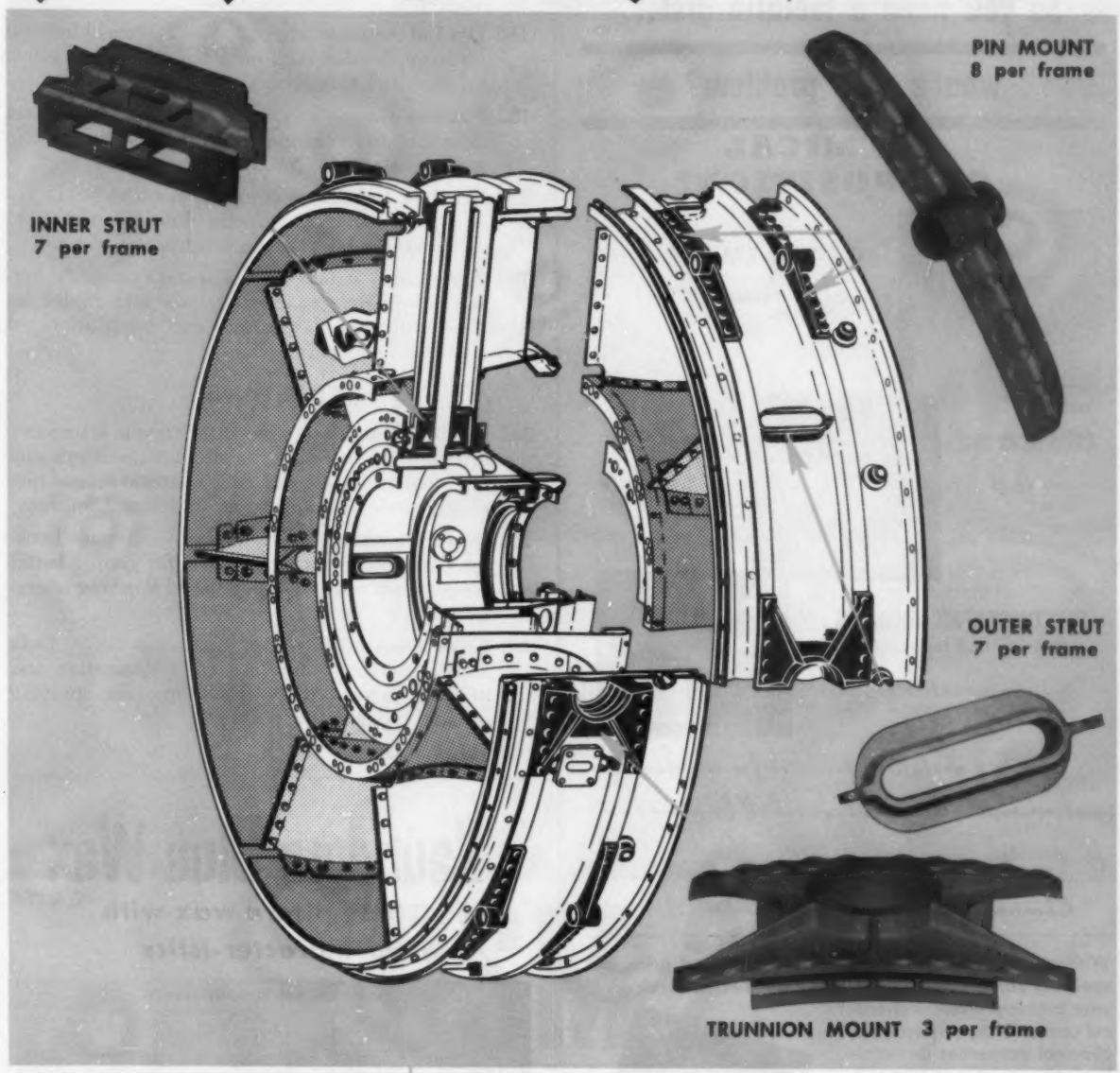
176 Infrared Heat — FOSTORIA CORP. — 6-page technical bulletin discusses infrared heat, the prediction of quantity and quality of radiation from heated sources, and other technical points.

177 Refractories — HARBISON-WALKER REFRACTORIES CO. — 4-page refractories data brochure gives detailed descriptions of various refractories, including the newest types.

178 Diffusion Furnace — LINDBERG ENGINEERING CO. — Literature describes a multi-tube, gaseous diffusion furnace designed for the semiconductor industry.

179 Hydraulic Valves — SARASOTA PRECISION PRODUCTS, INC. — Literature on a multiple selector hydraulic valve which is manually operated.

continued on page 54



MONO-SHELL castings of A-286 Alloy, poured by DOUBLE-V System, MEET GENERAL ELECTRIC'S REQUIREMENTS for the J79 Engine's Ruggedized Turbine Frame!

Part drawings by Misco, evaluated on-the-spot by General Electric, permitted expedited tooling, production to meet required metallurgical quality, and delivery of castings in record time. These four castings are a vital part of the Turbine Frame of the J79 Engine, which powers the Navy Grumman F11F-1F, USAF Convair B-58, USAF Lockheed F-104, Navy North American A3J, Navy McDonnell F4H, and the CJ-805 Engine which is a commercial version of the J79 design for powering the Convair 880 . . . . . *Send us your inquiries, details of your requirements, or parts for quotation.*

Misco Precision Casting Company

Plants in
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MUSKEGON, MICHIGAN

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what's your problem?

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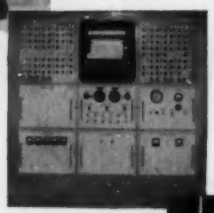
— basic



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ANALYSIS
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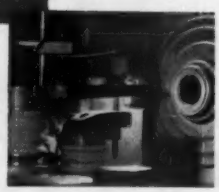

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USEFUL LITERATURE *(continued)*

180 **Die Lubricants** — SUN OIL CO. — Technical bulletin gives application data on a line of die lubricants for zinc and aluminum die casting.

183 **Vacuum Gage** — F. J. STOKES CORP. — Data sheet describes an ionization gage for accurate, uniform measurement of ultra-low pressures.

186 **Graphite Lubricants** — JOSEPH DIXON CRUCIBLE CO. — 4-page technical bulletin describes a line of colloidal natural graphite lubricants.

189 **Zirconium** — CARBORUNDUM METALS CO. — Technical information includes graphs and tables on the production, fabrication and applications of zirconium and hafnium.

FINISHING

202 **Electroplating** — HANSON-VAN WINKLE-MUNNING CO. — 8-page bulletin gives the specifications and applications for a line of anodes, anode accessories, chemicals for electroplating and metal finishing.

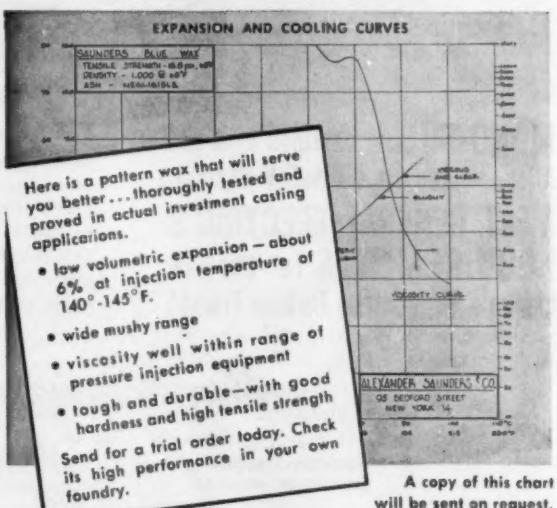
203 **Barrel Finishing** — BMT MFG. CO. — 30-page booklet gives instructions and charts for getting better results from your precision barrel finishing operation.

204 **Color Decoration** — THE ACROMARK CO. — Data sheet describes a unit for color decoration and printing on metal parts without masking, spraying or hand filling and wiping.

continued on page 57

Saunders Blue Wax

...the pattern wax with good character-istics



Here is a pattern wax that will serve you better... thoroughly tested and proved in actual investment casting applications.

- low volumetric expansion — about 6% at injection temperature of 140°-145°F.
- wide mushy range
- viscosity well within range of pressure injection equipment
- tough and durable—with good hardness and high tensile strength

Send for a trial order today. Check its high performance in your own foundry.

A copy of this chart will be sent on request.

ALEXANDER SAUNDERS & CO., INC.
95 Bedford Street, New York 14, N.Y.

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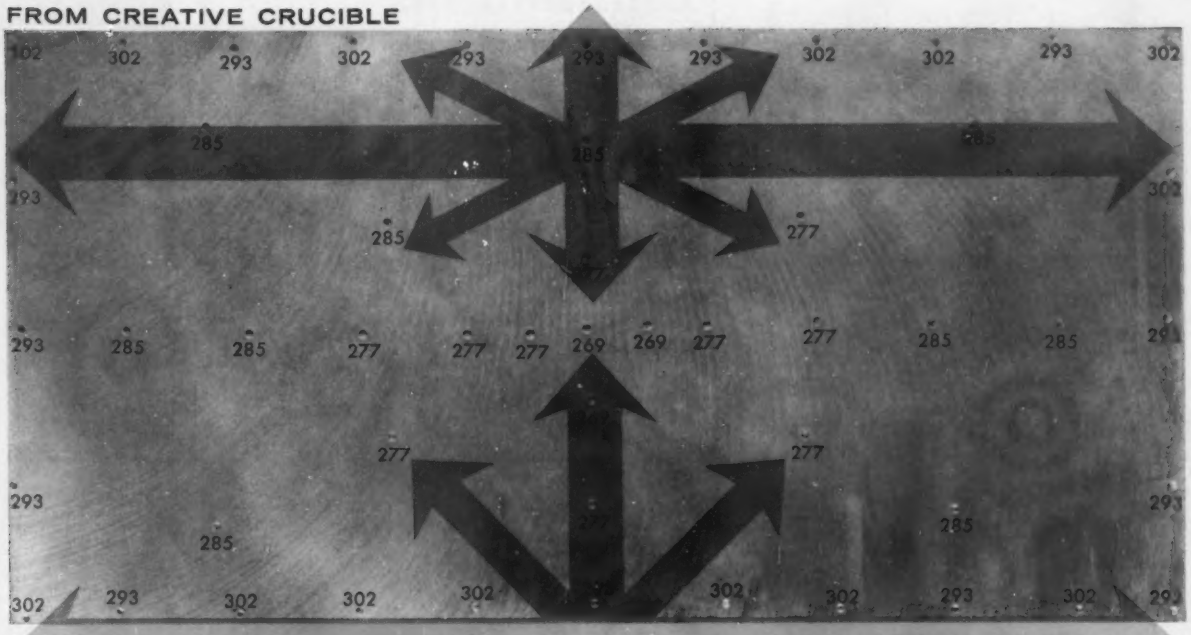
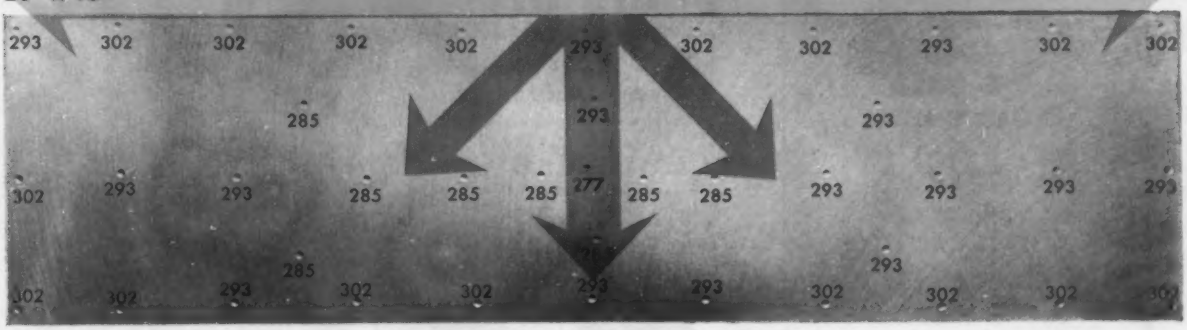
FROM CREATIVE CRUCIBLE



20" x 10"



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CSM 2

with positive, high hardenability

Now you can make larger plastic molds and die casting dies—for longer runs—and get better finishes!

Notice the small hardness gradient—across the surface and from surface to center—of these typical blocks of prehardened CSM 2. This small gradient indicates the more uniform hardness of CSM 2—and assures you of at least 5 major benefits:

- more uniform polish from top to bottom of cavity
- greater resistance to washing at center or bottom of cavity
- more positive shut-off surface—particularly in internally landed molds and dies
- more uniform machining characteristics from top to center of cavity
- elimination of heat treatment of most plastic injection molds and zinc die casting dies in sections up to 14" to 15" thick.

Complete details on Crucible CSM 2—either prehardened or annealed—are readily available through local Crucible steel service centers. For data, call the center nearest you or write: *Crucible Steel Company of America, Dept. TG27, Pittsburgh 30, Pa.*

CRUCIBLE STEEL COMPANY OF AMERICA

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All new from KUX

125 TON POWDER COMPACTING PRESS

with full 125 ton ejection capacity

MODEL 1100

COMPLETELY AUTOMATIC

125 TONS COMPACTING PRESSURE APPLIED BY UPPER AND LOWER PUNCHES

125 TONS EJECTION PRESSURE

MASSIVE, ALL STEEL MAIN FRAME

RUGGED MECHANICAL TOGGLE OPERATION

PRECISION PUNCH AND DIE ALIGNMENT

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FLOATING CORE ROD WITH TIMING CONTROL

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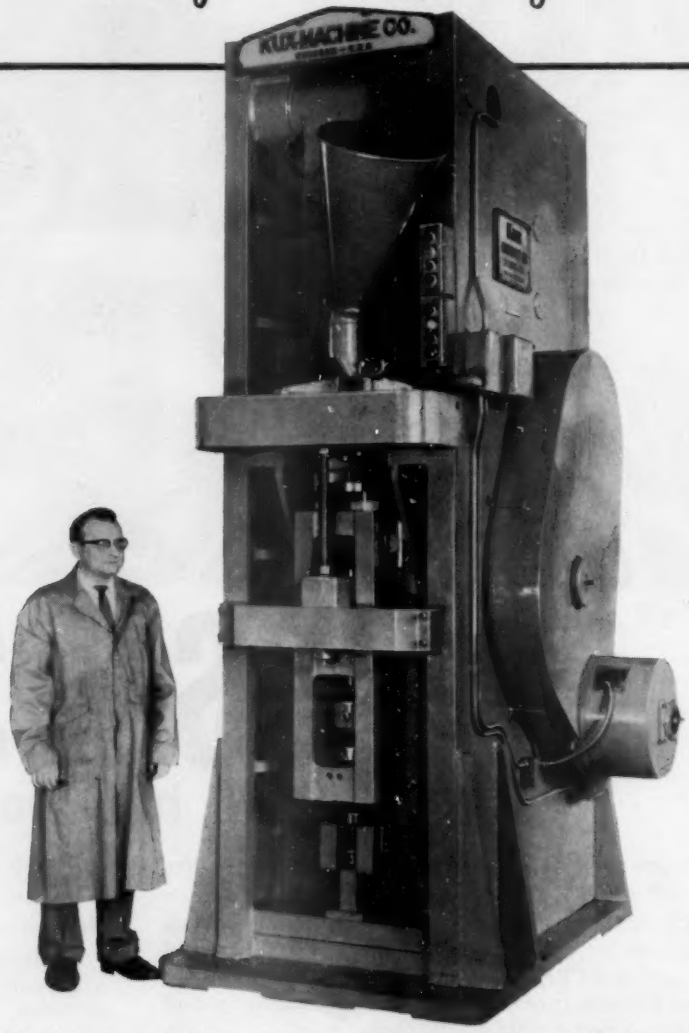
SIMPLICITY OF ADJUSTMENTS—NO NEED FOR CAM CHANGES



Massive, all steel, heavy duty mechanical press for powdered metals, ceramics, plastic preforms, tungsten carbides and other powdered or granular materials. An unusual feature of this machine is its capacity to eject a compact with full tonnage. Both upper and lower punches apply pressure to the part being formed with capacity up to 6" fill and 6" diameter or length. Punch pause mechanism allows compact to set while under pressure. Floating core rod mechanism with up to 4" stroke and moving die table can also be incorporated.

KUX MACHINE CO. • 6725 NORTH RIDGE • CHICAGO 26, ILLINOIS

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6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
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13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

Card Invalid Without Company Name

PLEASE PRINT — AUGUST 1960. DO NOT USE AFTER NOV. 15, 1960

Name..... Position.....

Company..... Kind of Business.....

Street.....

City..... Zone..... State.....

Please send me additional information and literature on items circled below.

1	19	37	55	73	91	109	127	145	163	181	199	217	235	253	271	289	307	325	343	361	379	397
2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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THE FOLLOWING WOULD LIKE TO GET PMM EACH MONTH:

DO NOT WRITE IN THESE SPACES

P 1

JOB

SIC

P 2

P 3

PER

Name _____ Position _____

Name _____ Position _____

Company _____

Address _____

_____

Major Products made at this address: _____

THIS PLANT (USES) (PRODUCES) ☐ ☐ TYPES OF PARTS CHECKED BELOW:

- ☐ Die Castings
- ☐ Extrusions
- ☐ Investment Castings
- ☐ Powder Metal Parts
- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

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812 Huron Road
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Cleveland 15, Ohio

USEFUL LITERATURE *(continued)*

205 Vibratory Finishing — ALMCO, QUEEN PRODUCTS DIV. — Catalog gives technical information on a line of vibratory finishing machines, show the results they produce.

206 Grinding & Finishing — MINNESOTA MINING & MFG. CO. — Review portfolio analyzes your grinding and finishing procedures to get optimum performance and economy.

207 Corrosion Inhibitor — ENTHONE, INC. — 3-page bulletin describes a rinse water additive which inhibits the corrosion of copper and brass and preserves freshly plated or cleaned metal surfaces during storage.

208 Polishing & Deburring — CONVERSION CHEMICAL CORP. — Data sheet tells how to chemically polish and deburr zinc die castings.

209 Specialty Coatings — BEE CHEMICAL CO. — Charts show how to select and use spray, dip, flow and vacuum metallizing specialty coatings.

210 Inserts — BOOTS CORP. — Technical brochure includes specifications and application data on a line of easily installed, screw-thread inserts which replace molded-in inserts.

211 Rust Preventive — MITCHELL-BRADFOR CHEMICAL CO. — Technical bulletin describes a rust preventative which is added to water and dries to a non-oily film.

216 Flat Grinding — MURRAY WAY CORP. — 8-page booklet lists the specifications and applications for the Micro-Polish unit for grinding flat surfaces.

EASY . . . ALL MATERIALS IN SPRAY CANS

FIRE-SAFE . . . or Chlorine-Free Formulas—SPECIFY

SPOTCHECK SAVES YOU MONEY!

Finds cracks and defects *you can't see.* Finds the cause of in-plant rejects and costly returns later. Simple, positive, fast, easy! Low-cost Spotcheck ends visual guesswork about defects open to the surface in any solid, nonporous material or part. Just spray it on from Spotcheck push-button cans. Cracks and defects open to the surface "pop" out bright red against white background. You can't miss them! Used and preferred in *thousands* of plants over other dye penetrant tests.

COMPLETE SK-3 KIT only **$36.00**

2 spray cans Penetrant, 2 spray cans Developer, 4 spray cans Cleaner-Dye Remover, instructions, cleaning cloth, wire brush. Steel CABINET-CARRYING CASE. Specify FIRE-SAFE or chlorine-free materials.

Prices: Continental U.S.A. only and Hawaii. F.O.B. our plant, Chicago, Illinois, plus local taxes.

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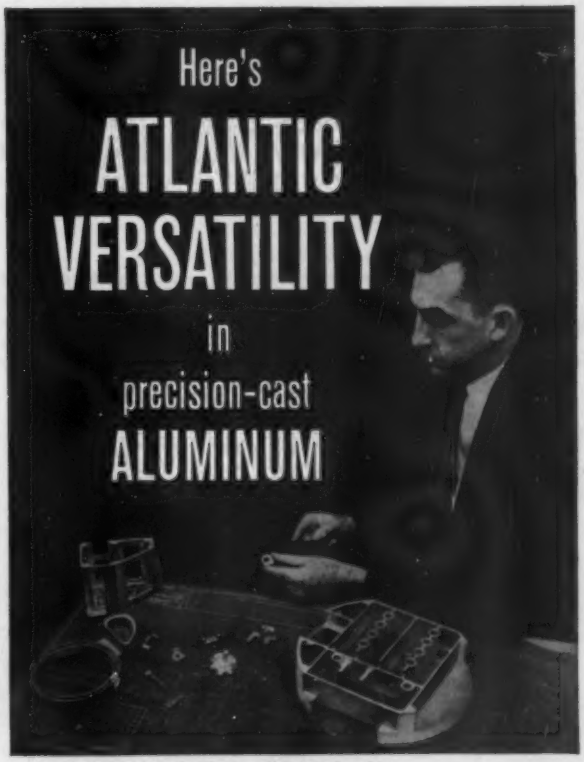


Typical precision aluminum castings produced at the Atlantic Casting and Engineering Corp.

LARGER CASTINGS NOW ECONOMICALLY PRODUCED

New production facilities at Atlantic Casting now make possible PRECISION ALUMINUM CASTINGS AS LARGE AS A SMALL SUITCASE (21" x 16" x 6") to meet most military specifications.

Finished piece cost may be as little as 30% that of finish-machined sand castings or comparable investment castings.

Tooling costs will average 20 to 25% that of comparable die castings.

As-cast tolerances are comparable with those produced in ordinary machining.

SEND OR PHONE TODAY FOR COMPLETE INFORMATION

ATLANTIC
CASTING and ENGINEERING CORP.
810 Bloomfield Avenue • Clifton, N. J.
PRescott 9-2450

Circle No. 10 on Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards facing page 56

1. **Stamping & Marking**—Acromark Co.—Catalog—and price list on a line of stamping and marking machines.

4. **Tool Steels**—Allegheny Ludlum steel Corp.—Booklet—describes the Steelector method for selecting the tool steel that meets your particular requirements.

9. **Die Casting Alloys**—Apex Smelting Co.—Booklet—shows the compositions, properties and other data on Apex die casting alloys.

10 **Plaster Mold Casting**—Atlantic Casting & Engineering Corp.—Complete information—on how larger aluminum castings with close tolerances are economically produced by precision casting methods.

11. **Piston Rings**—Auto-Diesel Piston Ring Co.—Catalog—lists plunger rings, tips, liners and combination tip-rings.

12. **Die Casting Machines**—B & T Machinery Co.—Information—on a line of zinc and aluminum die casting machines for producing fine-finish, high-density castings in volume quantities.

13. **Compacting Presses**—Baldwin-Lima-Hamilton Corp.—Technical data—on compacting presses for high density, close tolerance parts.

14. **Sinterings**—Bunting Brass and Bronze Co.—Engineering handbook—on the design and production of sintered metal parts.

17. **Die Casting Machines**—Cleveland Automatic Machine Co.—Technical data—on a line of high-speed die casting machines from 100 to 2000 ton capacities.

19. **Glass Cores**—Corning Glass Works—Technical data—on glass tubing for coring close tolerance holes in castings.

21. **Die Casting Dies**—Crucible Steel Co. of America—Technical data—on CSM 2 steel which eliminates the heat treatment of most zinc die casting dies because of its uniform hardness.

22. **Crucibles**—Denver Fire Clay Co.—Catalog—gives full information on a line of crucibles and funnels for the casting industry.

23. **Standardized Die Components**—Detroit Mold Engineering Corp.—170-page catalog—describes standardized die components which reduce design time and cut die construction costs.

25. **Crucibles**—Joseph Dixon Crucible Co.—Specifications—and other information on crucibles and other equipment for crucible furnaces.

26. **Tool & Die**—Gentry Carbide Tool & Die Co.—6-page brochure—shows their equipment for making carbide tools and dies.

27. **Metal Powder**—The Glidden Co.—Technical literature—describes the Resistox Metal Powders that are prepared by a special process which removes all soluble salts.

29. **Tiny Die Castings**—Gries Reproducer Corp.—Bulletin—lists specifications and prices for small zinc die castings.

30. **Zinc Alloys**—Henning Bros. & Smith—Reference book—and guide to the selection of zinc base die casting alloys.

31. **Investment Casting**—Hitchiner Mfg. Co.—13-page booklet—explains the ceramic shell investment casting process and shows Hitchiner's facilities.

34. **Die Casting Machines**—Hydraulic Press Mfg. Co.—Information—on a complete line of hot and cold chamber die casting machines from 100 to 2000 ton capacities.

35. **Investment Castings**—Humphrey Castings, Inc.—34-page facilities brochure—explains the investment casting process and shows some of its applications.

39. **Die Casting Machines**—Kux Machine Co.—Catalog—gives complete specifications on a line of 28 die casting machines.

42. **Sinterings**—Merriman Bros., Inc.—Technical bulletin—and catalog on highest quality, dimensionally accurate sinterings.

43. **Laboratory Services**—Metal Control Laboratories—18-page booklet—describes metallurgical and laboratory services available.

47. **Die Castings**—New Jersey Zinc Co.—Booklet—on the end uses of zinc die castings.

48. **Sinterings**—New Jersey Zinc Co.—Technical booklet—tells how to design for pressed brass and nickel silver metal powder parts.

49. **Mold Lubrication**—Pierce-Waller Inc.—Data sheet—on the Air-Lube system for cleaning and lubricating mold surfaces.

50. **Sinterings**—Reese Metal Products Corp.—16-page booklet—tells how to cut precision parts costs with the Remet powdered metal process.

51. **Iron Powder**—Republic Steel Corp.—Technical data—includes information on the chemical composition, physical properties and test evaluations of MHS6450 medium high strength alloy powder with 2% copper addition.

52. **High-Purity Nickel**—Sherritt Gordon Mines Ltd.—Brochure—includes prices and delivery information on high-purity nickel.

54. **Ladles**—Spincraft, Inc.—Data and prices—on stainless steel ladles of non-spill design which are 75% lighter than cast iron models.

56. **Melting Pots**—Tiffin Foundry Inc.—Literature—describes a complete line of standard size, quality melting pots for every non-ferrous melting operation.

59. **Burnishing Media**—The Abbott Ball Co.—Bulletin—tells how their burnishing media produces a gleaming, long-lasting, polished surface.

60. **Copper Plating**—Allied Research Products, Inc.—Technical data files—discuss a complete line of supplies for copper plating.

62. **Chemical Finishing**—Heatbath Corp.—Technical data—on chemicals for polishing, deburring and protecting die castings.

69. **Aluminum Alloy**—Kaiser Aluminum—Booklet—offered to foundry officials gives complete information on a new, high-strength, high-purity aluminum alloy, includes specifications, properties and production advantages.

70. **Die Steel**—Latrobe Steel Co.—Data sheet—shows why VDC hot work die steel can mean better die casting dies.

INDUSTRY NEWS *(continued)*

NEW DIE CASTING COMPANY FORMED

GROUND BREAKING ceremony. J. H. Washburn, High Point's mayor (left) John A. Weber (center) and R. M. Duggins, a director of the parent company (right).

Ground has been broken for Southern Die Casting and Engineering, a new company which has been formed to better serve the country with zinc and aluminum die casting. Southern Die Casting and Engineering will be located in High Point, North Carolina, home of the parent company, Adams-Millis Corporation.

The new plant will be ready for production within sixty days. Initially, there will be 25 to 30 employees and as many as 125 at peak operating capacity. Major equipment in the plant will consist of ten machines, several of which are of 400 ton capacity. The plant will have its own tool room to handle machining for its own use as well as for other companies.

Metallurgist, John A. Weber, widely known to the die casting world, has been appointed to direct sales and customer relations for the new company. He has made many contributions to the industry, one of which was his initiation of experiments in the Vibracast Process, a method of introducing mechanical impulses or waves to a die casting die to eliminate porosity in the casting, and to improve the dendritic structure.

A few years ago, Weber developed an anodizeable aluminum, permanent mold and die casting alloy known today as Alloy "W". This process has injected new color into the hot forming metal industries, expanded the scope of die casting, introduced a broader, more flexible latitude to designers and decorators in many potential fields of application.

DIE CASTING EXPOSITION GROWS

Interest in the National Die Casting Exposition and Congress continues to grow. This is evidenced by the increased number of exhibitors who have signed up for display space.

An earlier report (May PMM) listed 25 companies who had taken about 30% to 40% of the available space. As of June 30, an additional 25 companies have contracted for display space. These latest ones

continued on page 61

As the world's largest lead-zinc producer, we can make prompt delivery when you order electrolytically refined TADANAC Brand Special High Grade zinc. Our production is geared to meet punctually your requests for TADANAC Brand Special High Grade formulated to your specifications.

TADANAC Brand Special High Grade zinc slabs have recently been redesigned with strapping slots and hand-holds so they will travel better and be easier to handle.

All TADANAC Brand zinc is electrolytically refined to give die-casters a consistently high quality product, for greater design flexibility, more exacting dimensional tolerances and better finishes.

Cominco's Technical Service staff has had broad experience in the die-casting field and will be glad to help you get the very best castings from TADANAC Brand zinc.

Buy TADANAC Brand zinc for convenience, quality and service.

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED
Toronto WORLD'S LARGEST LEAD-ZINC PRODUCER Montreal

Tadanac Brand Metals are sold in United States by American Metal Climax, Inc., New York, Chicago, Detroit, Los Angeles

Circle No. 20 on Reader Service Card

TODAY AND TOMORROW

whatever may be your problems

BUNTING®

BEARINGS *Supply the answers*

...Cast Bronze Alloys...Powdered Sintered Metals...Bearing Aluminum Alloys

Why pay more for a bearing or part than you have to? Let Bunting help you get your requirements down on the lowest cost level compatible with adequate performance.

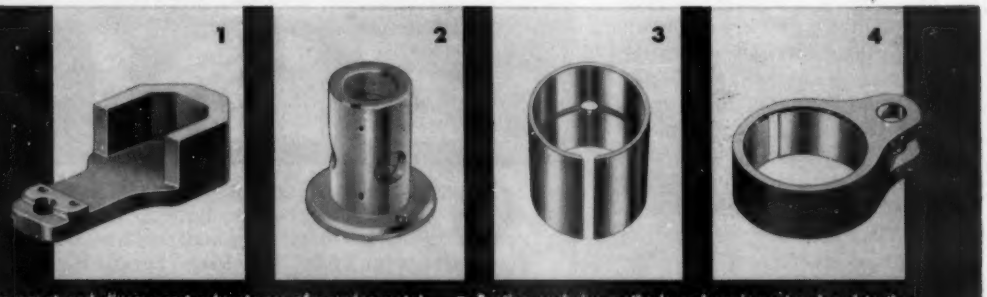
Today and tomorrow "the best" bearing means one that will do the job at the lowest possible cost. Let Bunting help you find the best bearing.

Bunting offers a highly competent designing, engineering and manufacturing facility operating in the field of bearings and special parts.

All modern proven materials are available, others are under study. Two plants with advanced equipment—of our own design—assure absolute production control and lowest manufacturing cost.

Let us re-examine your current bearing applications, or work with you on new requirements. Send in your prints for study and pricing. No cost nor obligation.

CASE IN POINT



1 The great and diverse cost advantages of powder metallurgy are revealed in the highly complex nature of this bearing support plate for power tools made in Bunting's Powdered Sintered Metals Plant.

2 An Aluminum Alloy helped cut the cost of this high speed turbo super charger bearing with its intricate machining of many dimensions and close tolerances.

3 Bunting exclusive methods and equipment reduced to the minimum the cost of this cast bronze spindle bearing with its extremely rigid specifications.

4 This connecting rod demands a fine profilometer reading on the finish of the bores in the two holes, axes of which must be parallel to each other within extremely close limits. Bunting makes such high precision work feasible cost-wise.

MACHINING SERVICE: Emergency service machine shops in Bunting Branches are there to render immediate low cost service on bearings or parts needed for experiment or maintenance. Your local Bunting Distributor can arrange for such service.

Write for these:

No. 46—TECHNOLOGY OF BUNTING BEARING ALUMINUM—A technical treatise on the composition and machining of Bearing Aluminum Bar Stock.

No. 1... ENGINEERING HANDBOOK OF POWDER METALLURGY—A comprehensive technical treatment of engineering and manufacturing of sintered metals, bearings and parts.

No. 158—GENERAL CATALOG—Complete listings of Cast Bronze and Sintered Bronze Stock Bearings and Bars and Bunting Bearing Aluminum Bars available from stocks of local distributors all over America.

THE BUNTING Brass and Bronze Company · Toledo 1, Ohio · Phone EVergreen 2-3451

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

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INDUSTRY NEWS *continued*

are: Alliance Mold Co., Inc., Aluminum & Magnesium, Inc., Buhler Bros. Co., The Carborundum Co., Clifford-Rockwell Co., Columbus Automatic Lubricator Co., Crucible Steel Co. of America, Dodge Steel Co., Electric Auto-Lite Co., Ford Motor Co. (Foundry Div.), Industrial Mfg. Corp., Monsanto Chemical Co., Norman-Leach Associates, National Lead Co., Penton Publishing Co. (Foundry Magazine), Productive Equipment Corp., Prospect Die Mold Co., Renite Co., Rebmann Co., G. W. Smith & Co., Inc., Sterling, Inc., A. Triulzi S.A.S., Vesuvius Crucible Co., Wolverine Die Cast Co., Udylite Corp.

RESEARCH CONTRACT

A contract for research work, applicable to re-entry aero-space vehicles such as Dyna-Soar, has been awarded to The Pfaudler Co., a division of Pfaudler Permutit Inc., Rochester, New York, by Air Research and Development Command of the U.S. Air Force.

continued on next page

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Spincraft
SKILL WILL DO IT

ladles last longer

Thousands of extra pours per ladle because they're stainless steel and specially reinforced.

NON SPILL SHAPE ELIMINATES WASTE!
75% LIGHTER THAN CAST IRON LADLES!

Available in all sizes, stainless and mild steel.

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Increase your profits with DFC crucibles & funnels

Since 1876, DFC has furnished crucibles, clay goods, and accessory materials which have set *standards of quality the world over*. More recently the unanimous acceptance and wide use of DFC transfer crucibles and funnels by the precision casting industry, is high testimony to their economy and dependability.

For precision casting...lost wax, investment and permanent mold. Transferring, pouring, spouting... there is a DFC crucible or funnel to meet your exact needs.

If you have a special crucible problem, let us work on it for you.

Denver Fire Clay Company

DENVER • SALT LAKE CITY • NEW YORK

The DENVER FIRE CLAY COMPANY DFO-5
3037 Blake Street, Denver 17, Colorado

Please send me further information on your full line of crucibles.

Name.....

Company.....

Address.....

City and State.....

Circle No. 22 on Reader Service Card

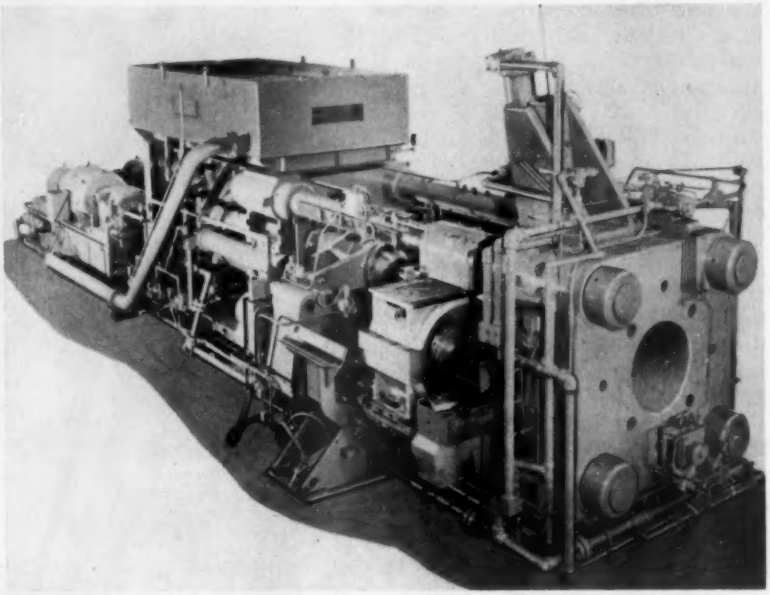
NEW EXTRUSION PRESS MADE BY YOUNGSTOWN FOUNDRY & MACHINE CO.

The Youngstown Foundry & Machine Company has shipped a 2600 ton extrusion press to American International Aluminum Corporation, San Jose, California.

The press is the newest development in the extrusion industry, having a double die slide and double containers, completely automatic. While one billet is being extruded another billet is being loaded, thus decreasing dead cycle time and increasing production potential. In utilizing the double tooling principle, the operator has an opportunity to cool tooling without any time loss. By so cooling the tooling, he greatly improves the quality of the extrusions.

Youngstown Foundry has built this press in the capacity of 1675 tons, and presently are building a 3300 ton press. The 3300 ton press will also be equipped with double die slide and double containers.

The double container and double die slide design is unique in that its flexibility permits it to be easily adapted for use in the extrusion of copper and brass. The addition of a few auxiliary components will enable the operator to eject "skulls" from the container, and to load billets, while copper billets are being extruded. The time saved during these operations should result in increased production.



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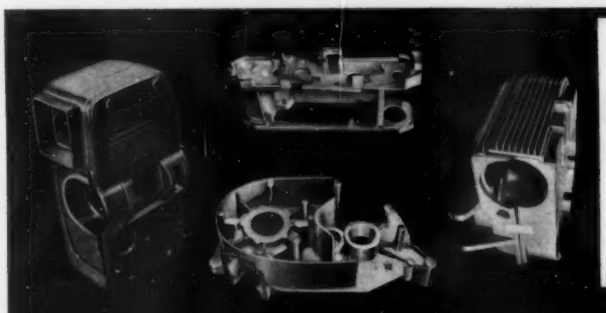


(Typical parts from JDE Die Casting Dies)

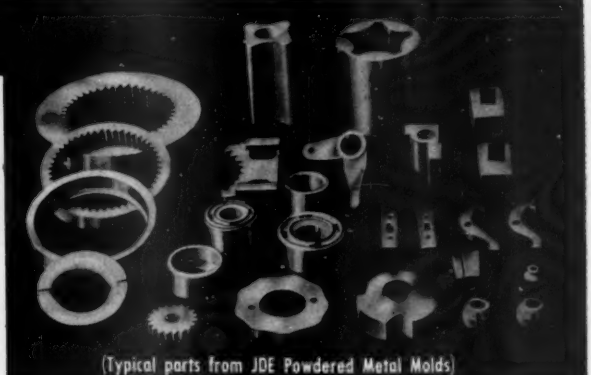
For DIES and MOLDS to produce your precision parts . . . Try JDE . . .

The largest and finest group of diemakers in Japan . . . With a staff of 137 engineers and a force of 1,004 toolmakers operating 746 major machine tools in 14 tool shops.

For your DIES and MOLDS demanding an unusual amount of master craftsmanship . . . Try JDE . . .

The largest and finest pool of specialized experience in engineering and manufacturing dies and molds in Japan . . . With 114 years' collective experience in serving manufacturing industries as die and mold specialists.

(For quotation, send us your drawings, specifications, samples and requirements.)



(Typical parts from JDE Powdered Metal Molds)

The Toolmakers of Japan

JAPAN DIE AND TOOL MANUFACTURERS EXPORT COMPANY, LTD. (JDE)

22 Onnazuka 4-chome, Ohta-ku, Tokyo, Japan Cable Address: DIEMEC TOKYO

DIE CASTING DIES • POWDERED METAL MOLDS • PRECISION CASTING PATTERNS • PERMANENT MOLDS • PLASTIC MOLDS • PRESS DIES • FORGING DIES • OTHER DIES & MOLDS • PRECISION DIESETS • DIE & MOLD PARTS • PRODUCTS & PARTS FROM DIES & MOLDS • JIGS • FIXTURES • GAGES • OTHER PRECISION TOOLS • ETC.

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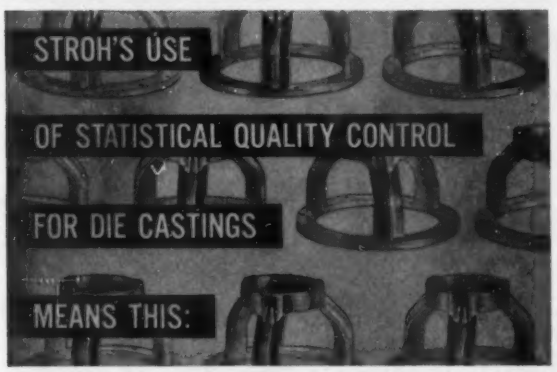
COLUMBIA TOOL STEELS

VANADIUM CASTDIE (type H13)—the "Old Pro" unbeaten champion of the hot work steels

Product of Skilled American Workmen



1. ASSURES ACCURATE PARTS: Critical dimensions can be held within specified limits.
2. LOWER INSPECTION COSTS: Lower costs come from your needing only a simple receiving inspection instead of a full sampling of each shipment of die castings.
3. UNIFORM HIGH QUALITY: This new concept of quality control for die castings means that buyers of die castings who rely on statistical dimensioning are assured of accurate parts ready for assembly.

LET US SHOW YOU how you can benefit. Many major manufacturers are now benefiting from the excellent results and the lower costs.

Stroh Die Casting Co., Inc.
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The ONLY Sensible Solution for a Complicated Part

BRASS POWDER

SAVED 30¢ per piece!

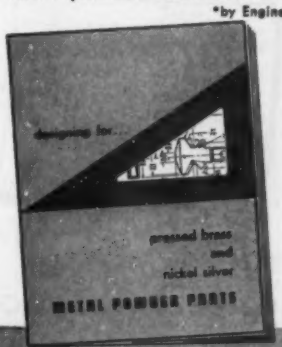
By converting production of this meter movement support core from an investment casting to brass powder metallurgy*, Hickok Electrical Instrument Company

ELIMINATED
- EXCESSIVE MACHINING
- SCRAP LOSS
- INSPECTION TIME
- HIGH REJECTION RATE

GAINED
- DESIGN IMPROVEMENTS
- CLOSER TOLERANCES
- CORROSION RESISTANCE *(without plating)*
- LOWER PARTS COST

Brass powder metallurgy can produce accurate, low-cost components for your products as well. See a metal powder fabricator for details.

*by Engineered Plastics, Inc., Watertown, Conn.



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160 Front Street, New York 38, N. Y.

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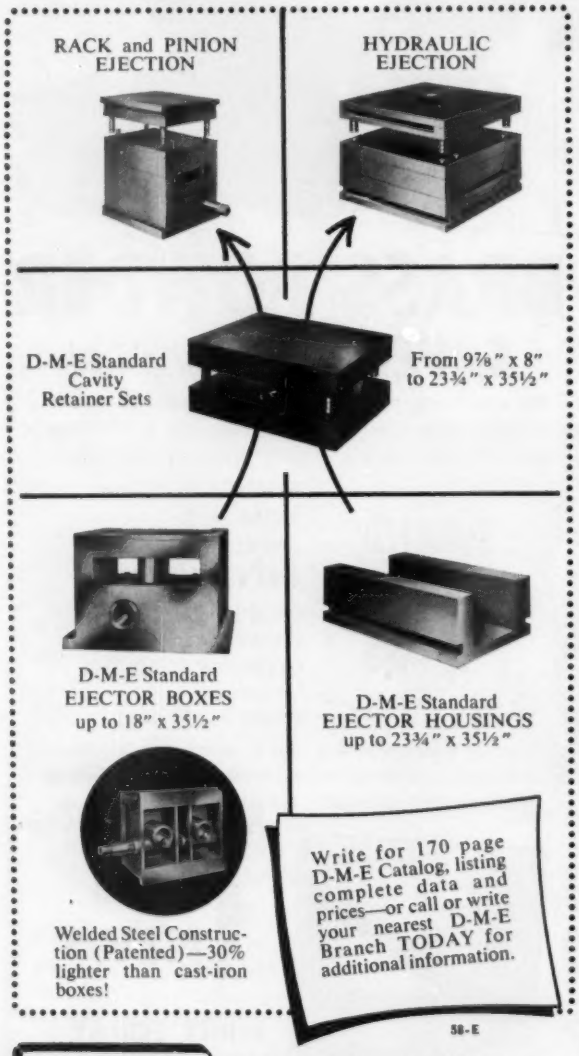
DIE MAKERS — DIE CASTERS

Standardize with D-M-E and Save!

Reduce design time and cut die construction costs with these D-M-E STANDARDS—combined to fit your needs!

For added savings, start with D-M-E Standards—they're "better to begin with" because they're made of the finest steel, finish-ground flat and square. Only D-M-E Standards give you "custom-made" construction with the cost-saving benefits of standardized, interchangeable components.


RACK and PINION EJECTION
HYDRAULIC EJECTION
D-M-E Standard Cavity Retainer Sets
From 9⅞" x 8" to 23¾" x 35½"
D-M-E Standard EJECTOR BOXES up to 18" x 35½"
D-M-E Standard EJECTOR HOUSINGS up to 23¾" x 35½"
Welded Steel Construction (Patented)—30% lighter than cast-iron boxes!
Write for 170 page D-M-E Catalog, listing complete data and prices—or call or write your nearest D-M-E Branch TODAY for additional information.
58-E

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- D-M-E of CANADA, Inc., TORONTO, ONT.: 156 Norseman Ave.

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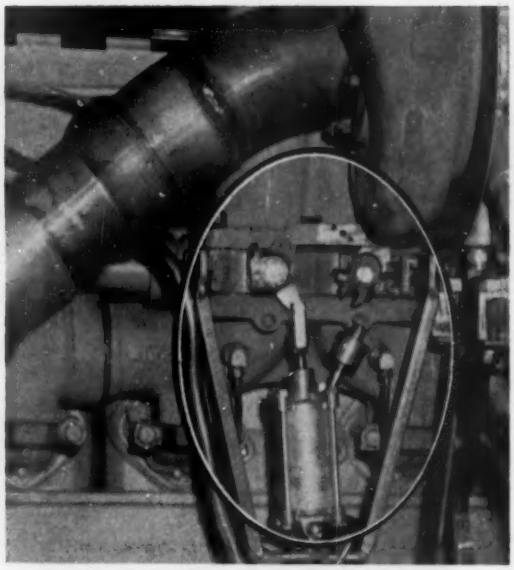


THE STAINLESS FLAPPERS (below right) are shell molded to resist the corrosion and

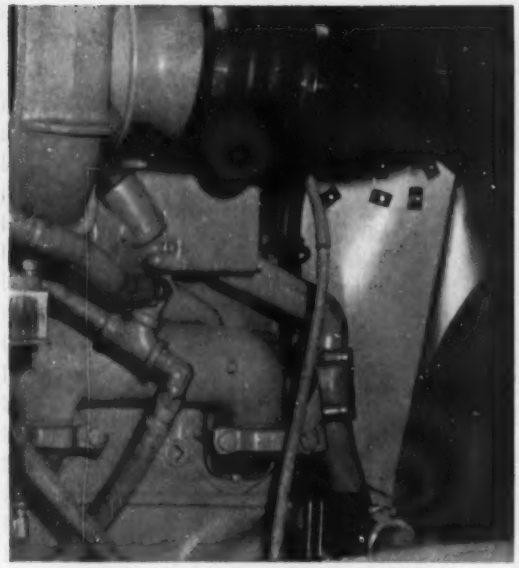
SHELL MOLDED CASTINGS EXTEND

DEEP IN THE HEART of truck engines is a new compression brake with a shell molded butterfly valve flapper that is cheaper to make and more durable than its fabricated predecessor. By using the shell mold process, welding, considerable machining, and all stress relieving is eliminated.

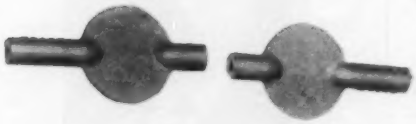
The compression brake is an auxiliary that operates independently of air or mechanical brakes on diesel- or gasoline-engine trucks. It consists of a butterfly valve installed in the exhaust pipe between the manifold and the muffler. When the truck goes downhill, the valve flapper closes as the foot throttle is released. This restricts the exhaust, building up a back pressure of 40-50 psi in the manifold. In effect converts each cylinder into a low-pressure air compressor.

The brake was developed by the Power Brake Equipment Co., Portland, Ore.

The flappers formerly were fabricated from a three-piece wrought stainless steel assembly, involving several machining operations. The center part or disc



high temperatures of automotive exhaust valves. Stainless steel (25% Cr., 12% Ni) is used.



VALVE LIFE

was turned from plate stock. It was set up at an angle to produce the slight peripheral bevel required. Two stub shafts were then machined and welded to either side of the disc, in a special aligning fixture. The assembly was next treated to relieve welding stresses.

Now the beveled disc and shafts are cast as an integral piece in a shell mold. Except for turning the stub shafts to fit into the housing bearings, all machining, welding and stress relieving are eliminated, bringing manufacturing costs down. The shell molding technique gives the required accuracy and high part-to-part dimensional uniformity as-cast.

The metal is HH stainless steel (ACI designation), a heat-resistant alloy with 25% chromium and 12% nickel. Especially formulated for use above 1200°F (truck operating temperatures may go above 1350°F), this alloy will not be warped by the hot exhaust gases.

The manifold associated with the brake also has been redesigned as an HH alloy stainless casting, for resistance to corrosion and high temperatures.

WHAT DO YOU NEED IN A DIE CASTING?

That die casting you need, whether simple or complex, deserves the services of specialists in producing for today's competitive markets.

Make sure early in its design. Submit your preliminary blueprints to Advance engineers for a critical review. Their recommendations and special facilities and processes may easily be the determining factor in its most efficient production.

These symbols are your assurance of highest quality control of zinc and aluminum alloys under ADCI standards.

ADVANCE

TOOL AND DIE CASTING COMPANY

SERVING INDUSTRY SINCE 1920

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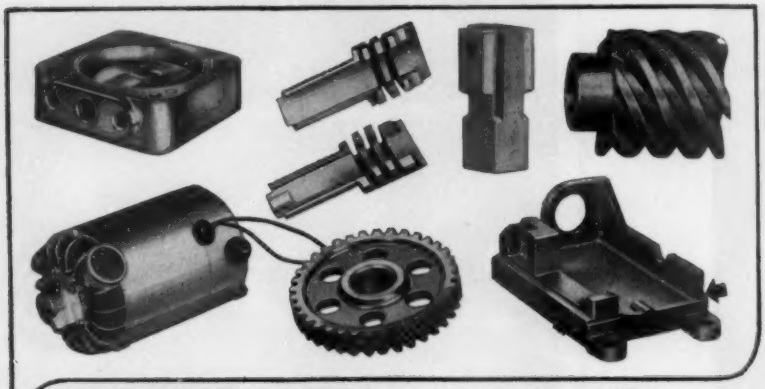

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A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

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FREE POWDERED METAL PARTS BOOKLET SHOWS . . .

colorful, newly revised 16-page booklet illustrates and describes:

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INDUSTRY NEWS *continued*

ADCI ANNUAL MEETING

Dates for the annual meeting of the American Die Casting Institute have been set at September 14 and 15, 1960. As always, the meeting will be at the Edgewater Beach Hotel, Chicago.

While the meeting will feature a review of accomplishments of the past year and plans for the coming year there will also be the presentation of the Doehler Award and this year, for the first time, the New Jersey Zinc Award.

Another outstanding feature of the meeting will be the PRECISION METAL MOLDING invitation breakfast on Thursday September 15.

WELLS APPOINTS WILSON

WILSON

Frederick H. Wilson has joined Wells Aluminum Corp. as general sales manager. He will direct the company's expanding sales activities and will concentrate on the expansion of their custom extrusion sales in the midwest.

WORKMAN PRESIDENT OF LATROBE STEEL

WORKMAN

SAXMAN

Resignation of M. W. Saxman as president of Latrobe Steel Company with his continuance as chairman of the board, and the elevation of J. E. Workman, executive vice president, to the presidency, was

announced by the company's Board.

Retirement culminates 36 years of service. It was in 1935 that Mr. Saxman became vice president of sales, 1940 elected president, and 1960 chairman of the board.

Mr. Workman is presently chairman of the Tool Steel Producers Committee of the American Iron and Steel Institute, and a member of other trade associations.

IPC ESTABLISHES STUDENT AWARD

AURBACH ROSS

PRECISION METAL MOLDING's president, Lester P. Aurbach, left, hands $500 award to Thomas Ross, first winner of The Industrial Publishing Corporation Work/Scholarship Award. The annual award, established this year in recognition of our company's 30th anniversary, is intended to point up career opportunities in the business press to young men with technical educations. It is open to juniors at six engineering colleges: M.I.T., Rensselaer, Ohio State, Case, Purdue, and Carnegie Tech. Winners get the cash award plus 10-weeks summer employment on an Industrial Publishing Corporation magazine's editorial staff.

SHIMEL JOINS TIFFIN

Harris R. Shimel has joined Tiffin Foundry, Inc. as sales manager and will concentrate on expanding the services offered to the die casting and non-ferrous industries. He was with the Chevrolet Div. of General Motors for 20 years and for the last four years has been a manufacturer's representative selling products and services to the die casting industry. Shimel was a co-founder and the first national president of the Society of Die Casting Engineers.

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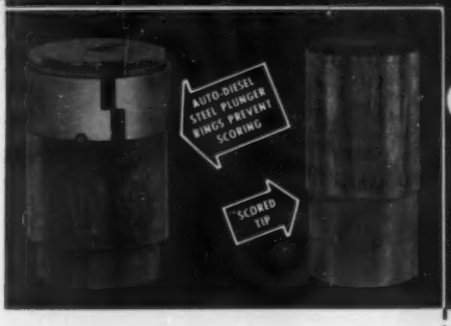
NEW TIP & RING PLUNGER COMBINATION



6 MONEY SAVING ADVANTAGES

1. Longer wear
2. Denser castings
3. Eliminates aluminum pick-up on sleeves
4. Reduces tip changing down-time
5. Eliminates buying or making new tips
6. You can salvage and use your old tips

Greater Efficiency

Solves problem of scored or worn tips—saving thousands of dollars per year for the die casting industry.

Beryllium copper and steel plunger rings on piston tips result in maximum service life.

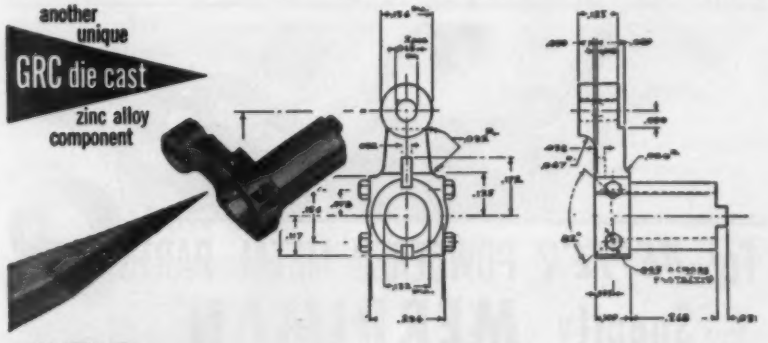
Catalog on Request

Plus—Auto-Diesel now offers stainless steel liners for goosenecks—increasing present life 4 to 1—literature on request.

1-9-2-1 AUTO-DIESEL AD CLEVELAND 1-9-5-9

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

another unique GRC die cast zinc alloy component



GRC die casting helps Lionel achieve tiny part authenticity

This intricate toy crank was die cast in zinc alloy by GRC in a single automatic operation. Cost? Little more than $5.00 per thousand in lots of 500,000. Result? Produced quicker and more economically than Lionel could themselves. Less than half an inch overall, it is typical of the many small (maximum is 1¾" ½ oz., no minimum) parts problems solved by GRC's unique techniques. Gries' specialized machines deliver parts ready for use—uniform, accurate, clean—no trimming, no assembly, no scrap loss.

If you have a small parts problem, write, wire or phone for GRC's die casting bulletin or send prints for quotation.

25 years of progress in tiny parts

GRIES REPRODUCER CORP.
World's Foremost Producer of Small Die Castings
157 Beechwood Ave., N. Y., NEw Rochelle 3-8600

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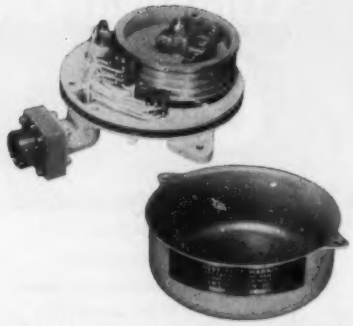
Assembly



A PROBLEM SOLVED BY

HUMCO

No matter what your investment casting problem, HUMCO can solve it. Complex shapes are readily produced. High tolerances are routine. We handle parts weighing from a few grams to 25 pounds in an extremely wide range of alloys... Physical properties meet or surpass Federal and military specs.

WE CAN DO IT

Our extensive facilities and wealth of experience enable us to produce exactly what you want in a precision casting. Deliveries average about 10 days after tooling but much faster in emergencies. Our quality control procedures have Air Force cognizance

WANT TO BUY THE FINISHED PRODUCT?

We'll perform any degree of finishing, right up to delivering the completed product.

HUMCO also offers product research, development and design services.

1 PRODUCT BROCHURE

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For *BETTER* POWDERED METAL PARTS
Specify MERRIMAN

QUALITY • PERFECTION
UNFAILING PERFORMANCE

Originators of sintered helical gears. Master craftsmen in producing highest quality, dimensionally perfect parts from powdered metal in Brass, Bronze, Copper, Nickle Silver, Steel, Iron, Iron Alloys — Copper Infiltration.

WRITE FOR CATALOG AND TECHNICAL BULLETIN.

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REPRESENTATIVES IN PRINCIPAL CITIES
100 Beach Road Massapequa (L.I.), New York
793 Laurelton Rd. Rochester 9, N.Y.

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NEW PRODUCTS

(continued)

PNEUMATIC VACUUM VALVES

VECO VACUUM CORP. — Type PV pneumatic vacuum valves are of bellows-sealed construction and are individually tested on a mass spectrometer leak detector. A long stroke, short flow path, and unobstructed port permit maximum conductance.

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THERMOCOUPLE COMPENSATOR

HARCO LABORATORIES, INC.—A thermocouple reference junction compensator eliminates the conventional ice bath as a reference temperature source. The fifteen channel unit also permits the remote location of the measuring instrument.

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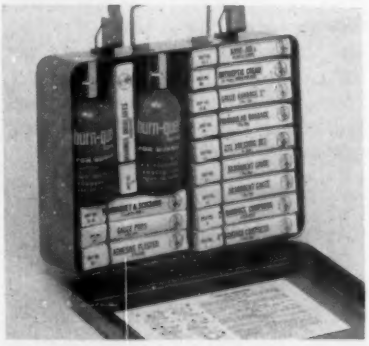
FIRST AID KIT



A. E. HALPERIN CO., INC. — The HALCO Burn-Quel first aid kit features an aerosol spray used to treat burns and scalds. The new spray gives immediate relief from pain and assists the growth of new skin tissue. Waterproof, dustproof packaging keeps the dressings fresh and clean.

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THE PIERCE-WALLER

AIR-LUBE

SYSTEM

CUTS COSTS for DIE-CASTERS

• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

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PIERCE-WALLER, INC.

P. O. Box 2121A • DAYTON 29, OHIO

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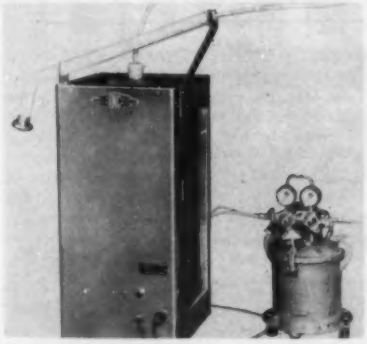
ELECTROSTATIC SPRAYER



IONIC ELECTROSTATIC CORP. — A portable, high-speed, centrifugal-type electrostatic hand gun applies both metallic and non-metallic paints and coatings either indoors or outdoors. The unit uses the principle of electrostatics to charge and guide particles of coating material.

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HIGH STRENGTH ADHESIVES

MINNESOTA MINING & MFG. CO. — Three new high strength modified epoxy resin adhesives cure at room temperature under contact pressure. They provide bonds with shear strengths over 3000 psi in applications where heat and pressure cannot be applied during the bonding operation. The bonds have good resistance to water, oil and aromatic fuels.

Circle No. 242 on Reader Service Card

SIZE-REDUCTION MILL

F. J. STOKES CORP. — The Tornado size-reduction mill screens 100 lbs. of carbide powder in 20 minutes, instead of the three or four hours usually required. Besides the time and labor savings, the unit produces a high degree of uniformity in particle size.

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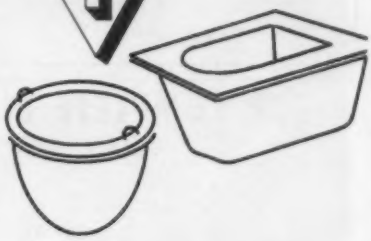
SPECIFY

TIFFIN QUALITY

"Mark of Quality"



MELTING POTS

There is

A TIFFIN FOUNDRY Quality Melting Pot for all Non-ferrous Metal.

- IMMEDIATE DELIVERY on all standard size melting pots from stock.
- LONGER LIFE—The iron used in our melting pots is especially engineered for its heat and erosion resisting qualities. This means longer pot life.
- REAL ECONOMY—Pound for pound of melted metal, it costs less when you use Tiffin Foundry Quality Pots.
- SPECIAL POTS available. Send us your specifications.
- OVER 50 YEARS EXPERIENCE in the manufacture of quality pots and die equipment.

SPECIFY the pot with the trademark of quality—they are engineered to last.

DIES, PLUNGERS, NOZZLES & BAR STOCK ALSO AVAILABLE

Write today for complete information.

THE TIFFIN FOUNDRY, INC.
TIFFIN, OHIO

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PMM OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Road, Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

POSITIONS OPEN

DISTRICT SALES MANAGER — Investment casting company has an opening for District Sales Manager to cover a tri-state area in the middle west. Position entails total supervisory responsibility for activities of sales representative in the area and technical liaison with customers. Must have degree in Mechanical Engineering or Metallurgy, or equivalent. Previous experience in investment casting desirable but not necessary. Our personnel is aware of this ad. P. O. Box 7160

Investment Casting Foreman, ferrous and nonferrous, experienced in all phases, good opportunity, New York area, send resume' and salary requirement. P. O. Box 8160.

FOR COMPLETE DIE CASTING SERVICE

After 30 years of serving the die casting industry we have expanded to offer you complete die casting service.

DESIGN —
Our staff of experienced die casting engineers stay with the job from initial design to finished casting.

DIE CASTING —
Complete facilities to produce castings weighing 14 lbs. zinc.

PLATING —
Plating of all sizes, weights, and types available, from barrel zinc to the most difficult, automobile bumpers.

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Our laboratory and inspection facilities is your assurance of quality castings.

Sales Representative —
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Detroit 35, Michigan
Telephone:
Broadway 3-6283

DiSalle

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Toledo 9, Ohio

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COMPACT FINISHING MACHINE

ALMCO, QUEEN PRODUTS DIV. — The VT-70 bench model vibratory finishing machine is especially suited for small metal parts which need precise, uniform finishing. The portable unit is designed to permit fast finishing action while maintaining high finishing standards.

Circle No. 244 on Reader Service Card

BRASS AND BRONZE PELLETS

I. SCHUMANN & CO. — Copper base alloy brass and bronze pellets permit faster and more efficient handling and melting. Since they can be moved by means of bins, pipes, and feeders, there is no need to handle ingots.

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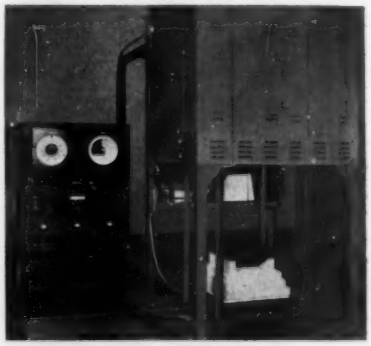
ELECTRIC FURNACE



HARROP PRECISION FURNACE CO. — The NMR-20E controlled atmosphere electric furnace maintains temperatures up to 2700°F with a ±2°F accuracy. Both firing to high temperatures and cooling are rapid, allowing quick response to the automatic program controller.

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HIGH CAPACITY LIFT TABLE

SOUTHWORTH MACHINE CO.—The LT-12 tandem lift table has a capacity of 12 tons. The unit uses

a self-contained motor and hydraulic, scissor-type lifting mechanism and is available with platforms or custom built working devices.

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REFRACTORY BRICK

HARBISON-WALKER REFRACTORIES CO. — A refractory brick, developed especially for aluminum melting, has improved resistance to corrosion and destructive impact during charging, and reduces alloy contamination. Alumina in stabilized crystalline form is the main constituent of the new brick.

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PORTABLE HARDNESS TESTER

NORTHERN MFG. & ENGR. CO. — A portable hardness tester provides direct readings on Rockwell scales to an accuracy of ½ point. The light weight units weigh 6½ lbs.

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POWER ROLL-OVER UNIT

DEPENDABLE SHELL CORE MACHINES, INC. — A power roll-over unit is available for the 200 and 100 S series of Dependable shell core machines. The unit provides partial mechanization by permitting the operator to easily roll, invest, rock and drain a corebox.

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VAPOR SPRAY DEGREASER

RANDALL MANUFACTURING CO. — The Ramco vapor spray degreaser removes grease and oil from metal parts in a quick, thorough, one-step process. It uses non-flammable, non-corrosive solvents in a manner that leaves the parts clean, warm and dry.

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QUALITY is a FIXTURE at L.D.C.

. . . and these fine finish plumbing fixtures tell you why

Quality is fashioned by craftsmanship. Take these sparkling chrome plated zinc castings. Note their modern, graceful lines and soft, smooth finish . . . made possible only by the qualities of purity and surface soundness and uniformity of the alloy; and the rigid maintenance of close tolerances by controlled production methods and equipment.

And here is something else! The serrations for the mating spline in the handles of these fine fixtures are held to close dimensional tolerances by reason of the identical same qualities that govern the economical production of these castings.

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Harry W. Harding
235 Burke Drive
Tel: Amherst 1164

CLEVELAND, OHIO
William Kranz
20001 West Lake Road
Tel: Edison 1-6888

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Tel: Baldwin 4-3523

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Tel: Fireside 8-3985

PHILADELPHIA, PA.
Albert B. Reid
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Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

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Southern Die Casting & Engineering 13
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T

Tiffin Foundry, Inc., The 69
A. Triulzi 27

V

Vanadium-Alloys Steel Co. 18

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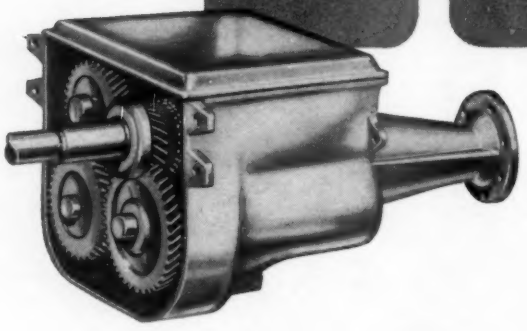
APEX 39-11

(WITH 11% SILICON)



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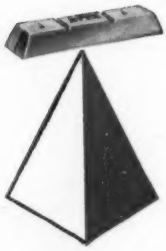

Research leadership back of every ingot

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Shows composition, properties, other data on Apex products.
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